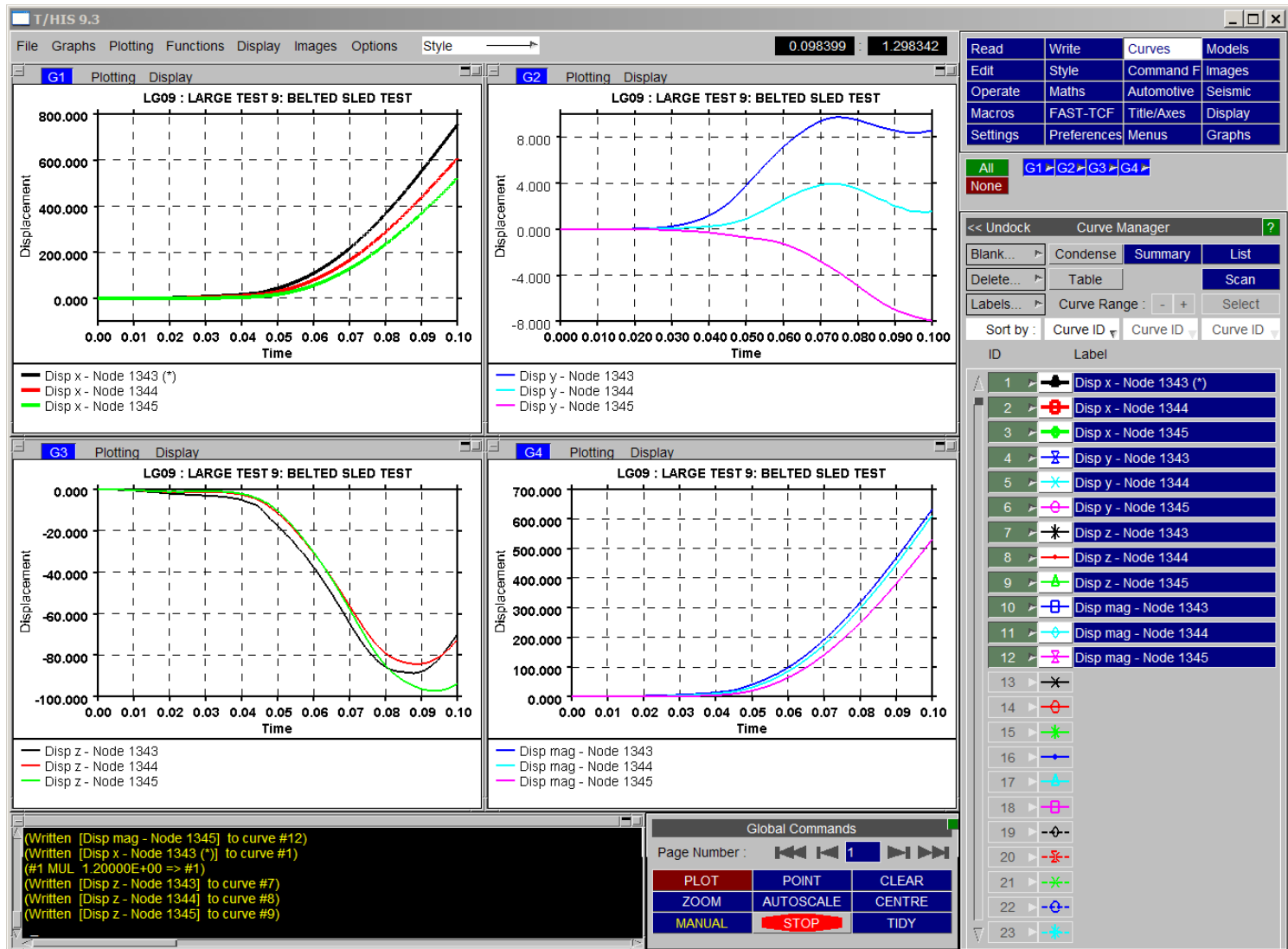


# T/HIS 10.1



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*LS-DYNA is a registered trademark of Livermore  
Software Technology Corporation*

- Data is read from LS-DYNA output files and is stored in T/HIS as curves. Each curve is a series of XY points, usually data-vs-time.
- Curves may also be read from other sources: csv file, T/HIS curve file (\*.cur), \*DEFINE\_CURVEs from a keyword input file, or by typing in at the Keyboard.
- Curves may then be operated on, e.g.
  - Filtering (Automotive menu)
  - Adding, multiplying, etc by constants
  - Adding, multiplying, etc curves to each other
  - Combining X-vs-time with Y-vs-time to obtain X-vs-Y
  - Many others: see Operate, Maths, Automotive menus
- Many options for changing the appearance of graphs (available by right-clicking the curve itself, or the axis; also from menus)
- Curves may be written to T/HIS .cur file or csv file
- T/HIS may be run stand-alone or within D3PLOT to synchronise with animations.

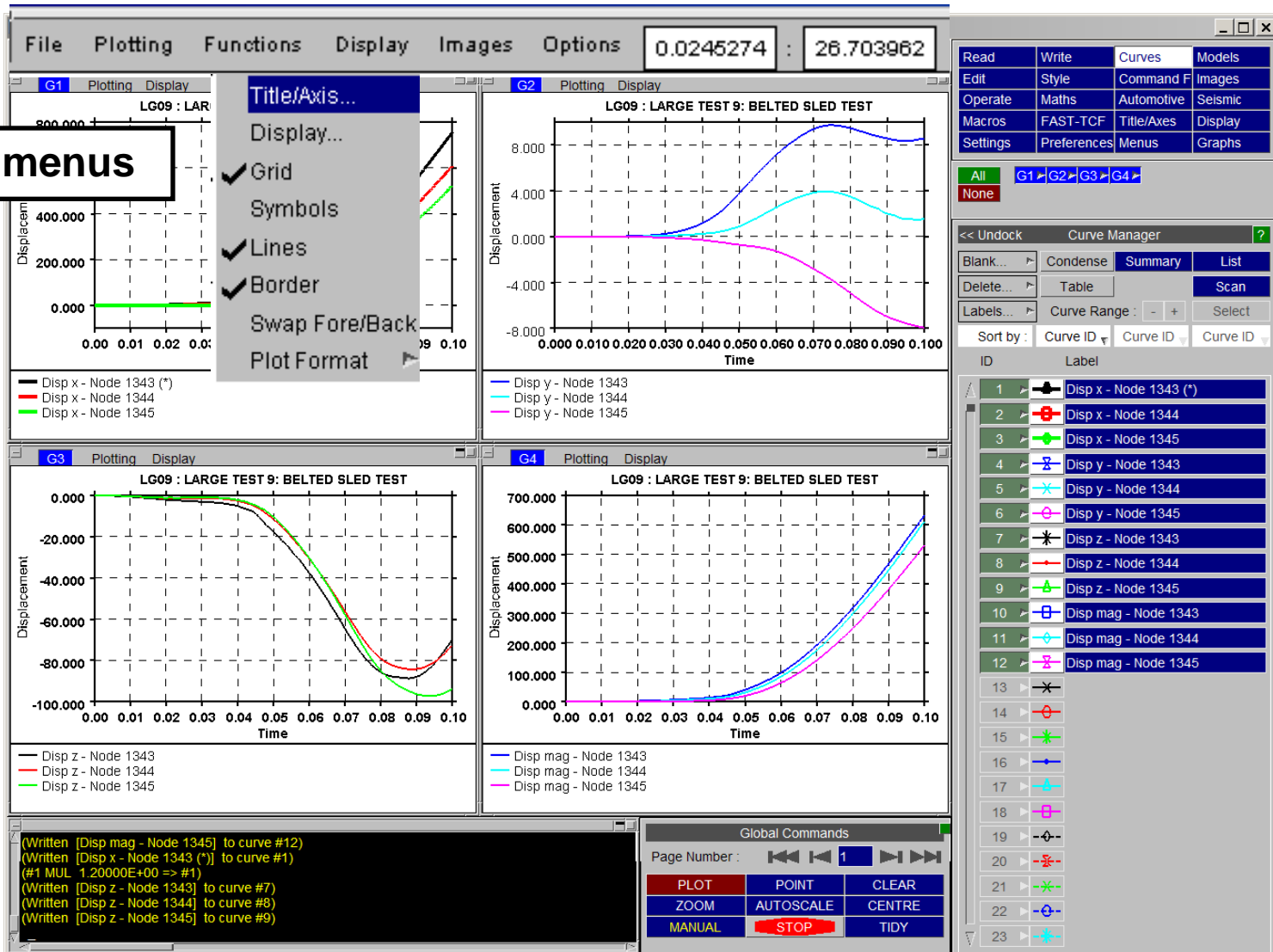
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# User Interface

Oasys

T/HIS

Top menus



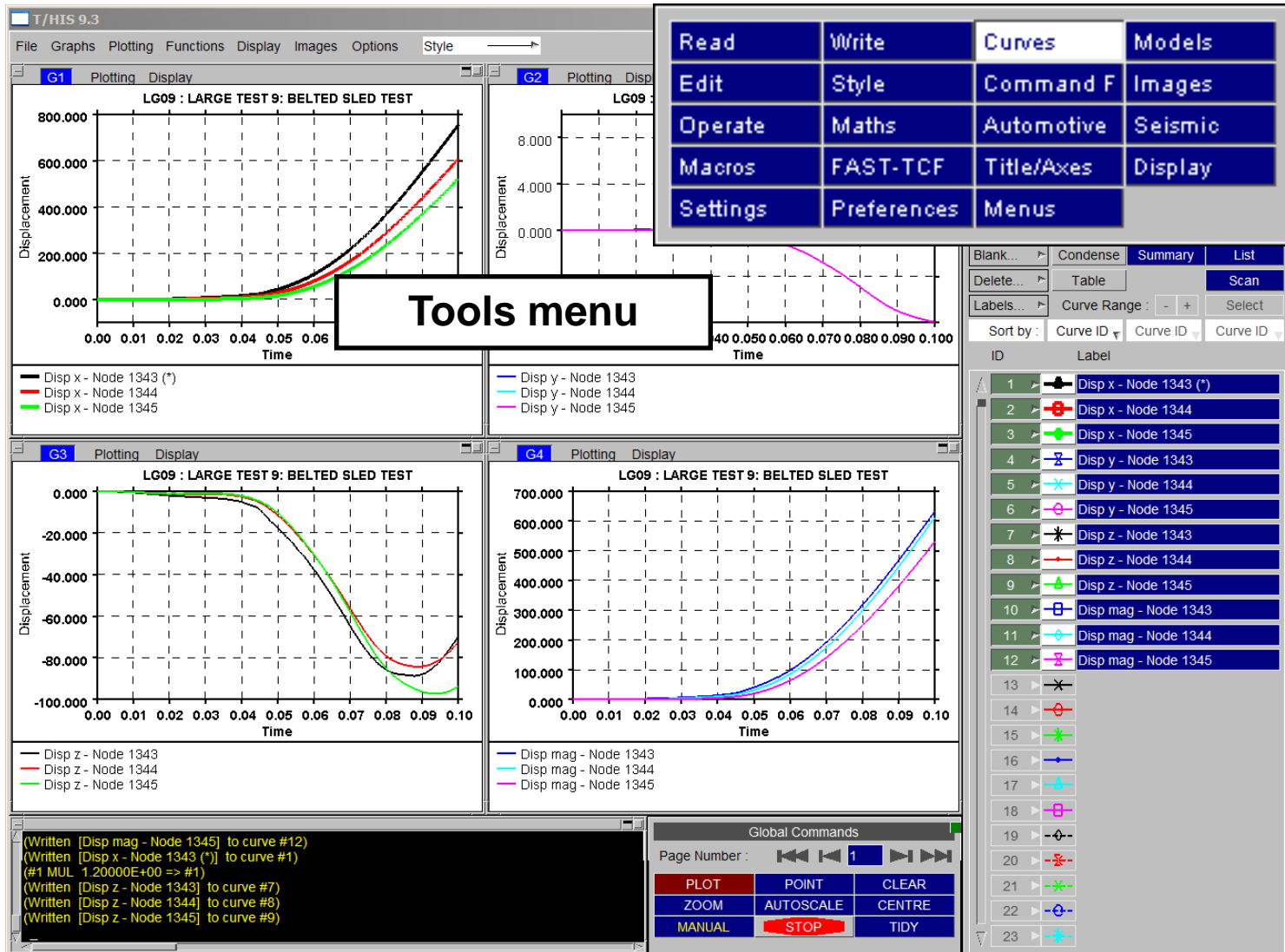
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Oasys

LS-DYNA ENVIRONMENT

ARUP



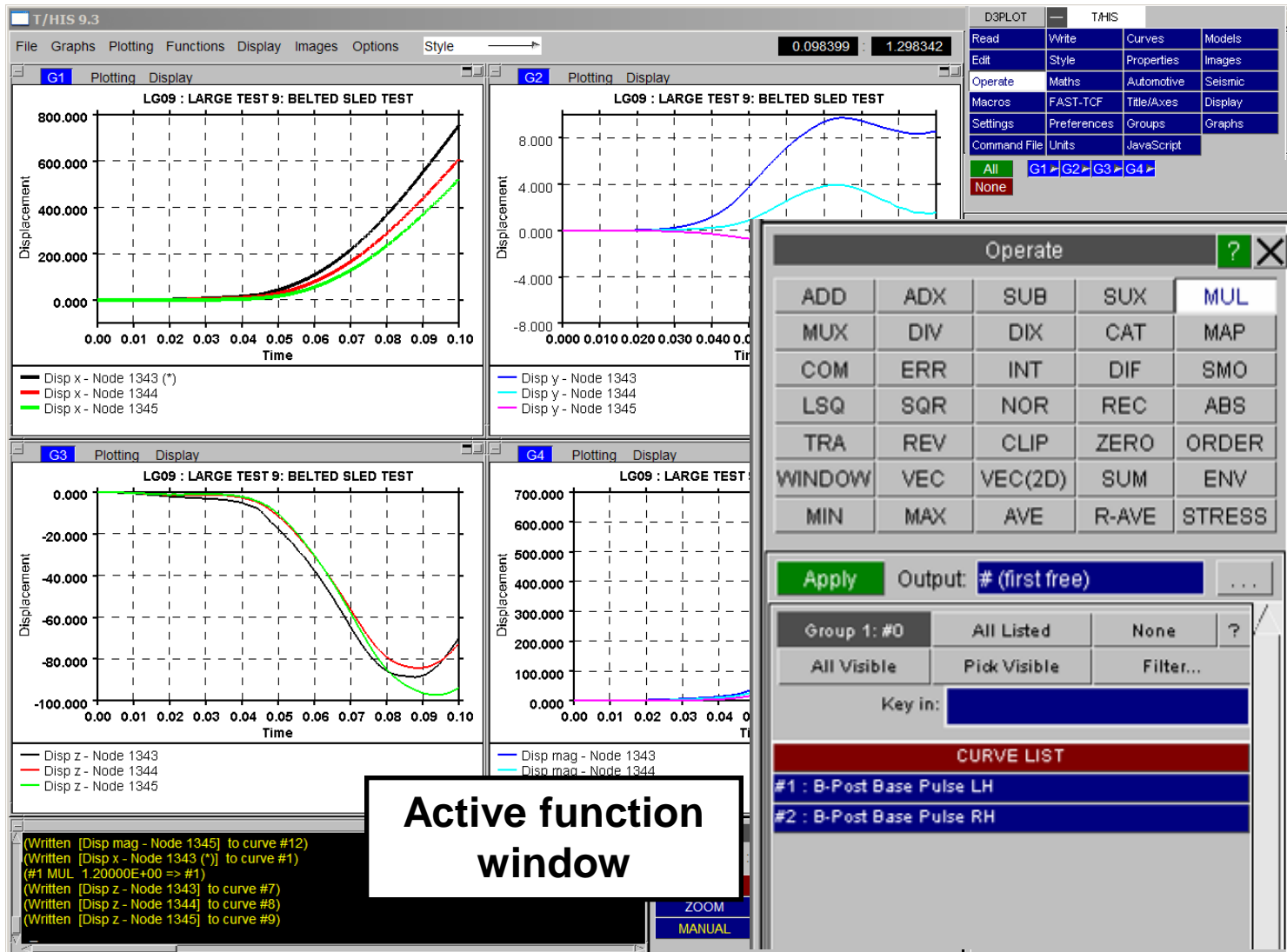


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# User Interface

Oasys

T/HIS

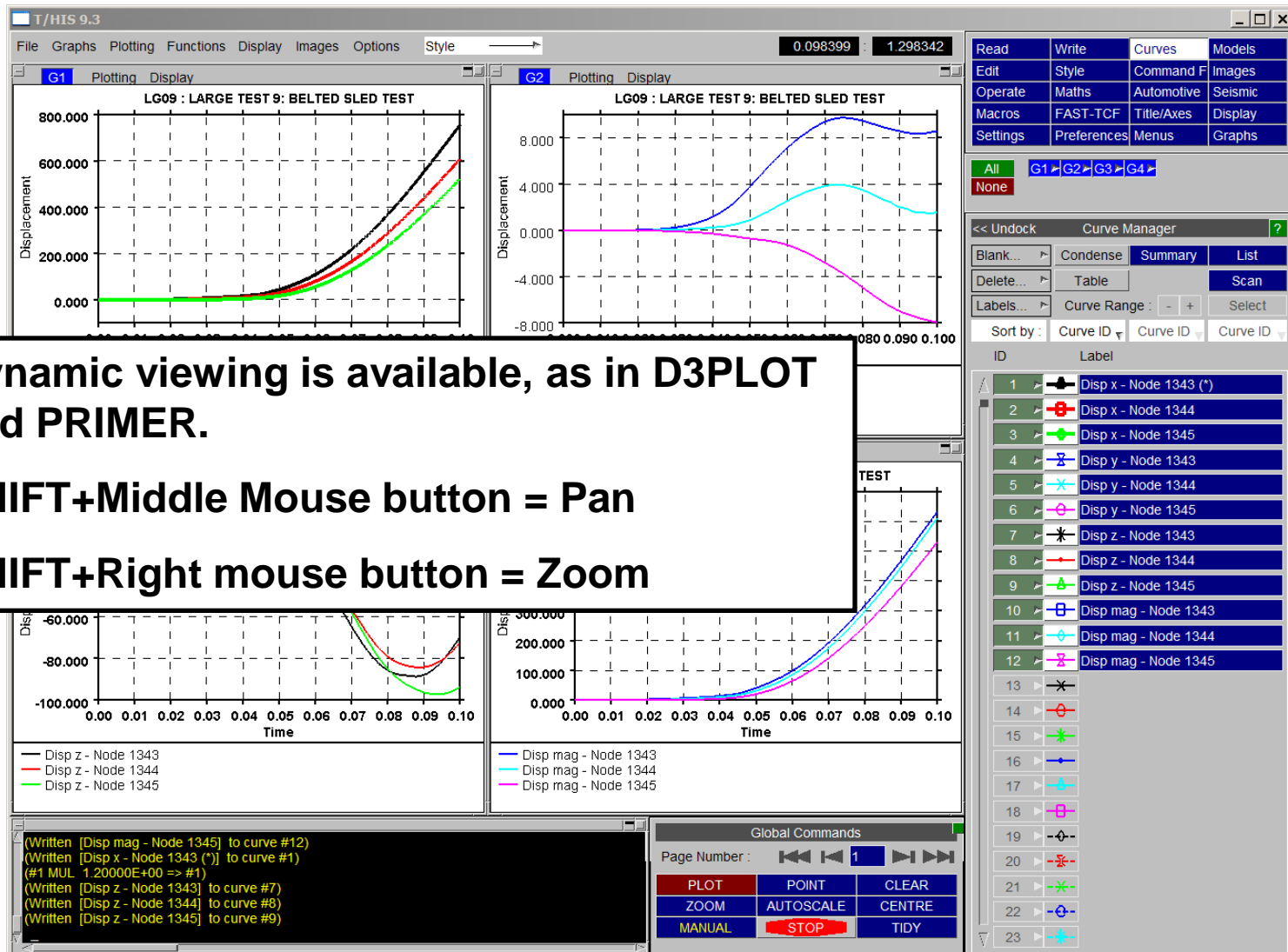


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Oasys

LS-DYNA ENVIRONMENT

ARUP



Dynamic viewing is available, as in D3PLOT and PRIMER.

SHIFT+Middle Mouse button = Pan

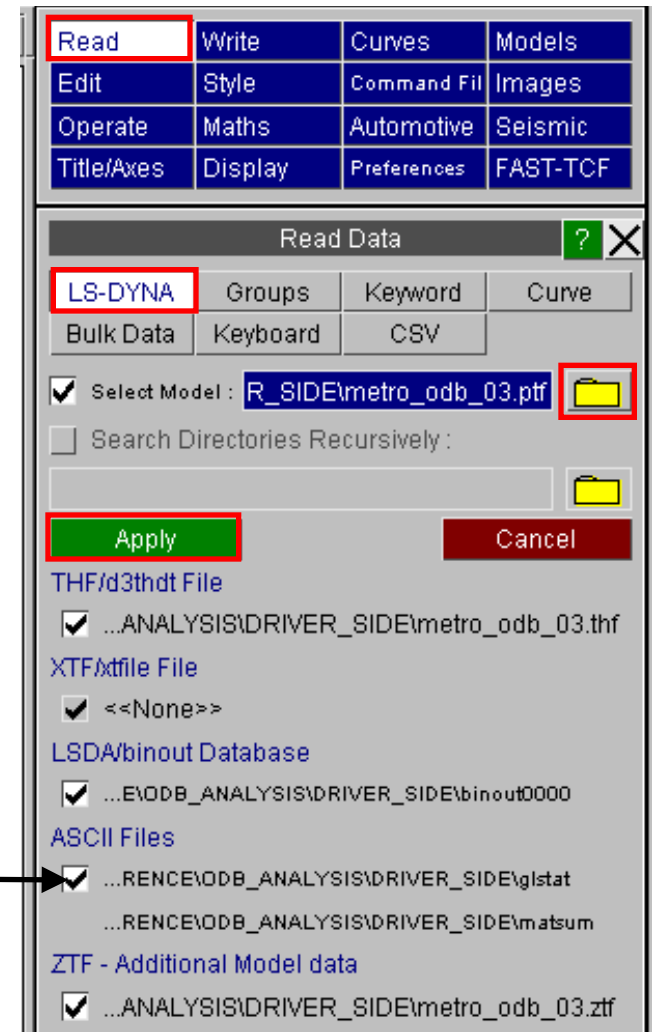
SHIFT+Right mouse button = Zoom

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# Reading LS-DYNA results

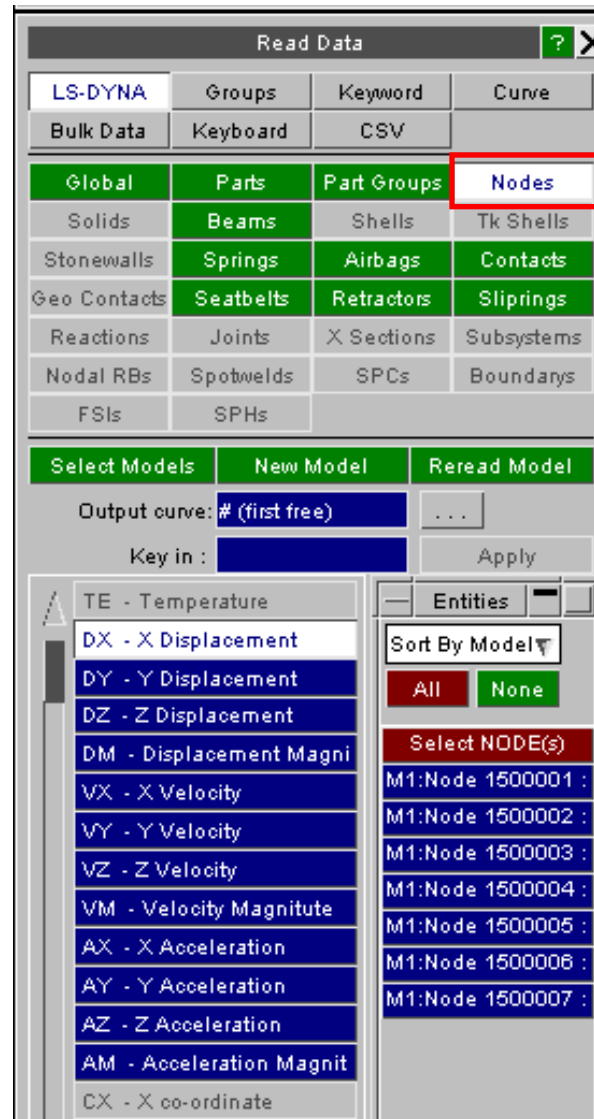
- To read LS-Dyna output, browse for the results files and select any one file from the required model (e.g. if using LSTC filenames, d3thdt, glstat, etc)
- All time history results files for that model will be loaded automatically when you press 'Apply', unless you first un-check the box for any particular results file.
- Don't forget to press "Apply"!



Can de-select any particular output file

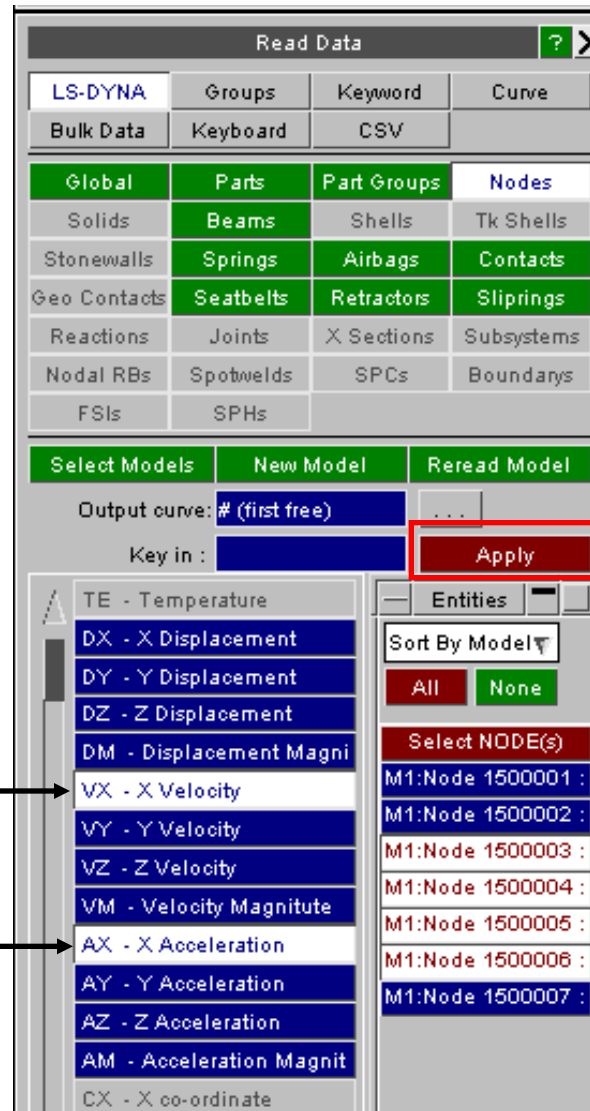
The entity types for which time-history data is available are shown by the green buttons.

Press one of these to make the data component menu and entity selection menu appear.



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# Reading LS-DYNA results



After selecting data components and entities, press Apply to read the data into T/HIS and make the graph appear.

Click the data component. To select more than one component, SHIFT-click or CTRL-click

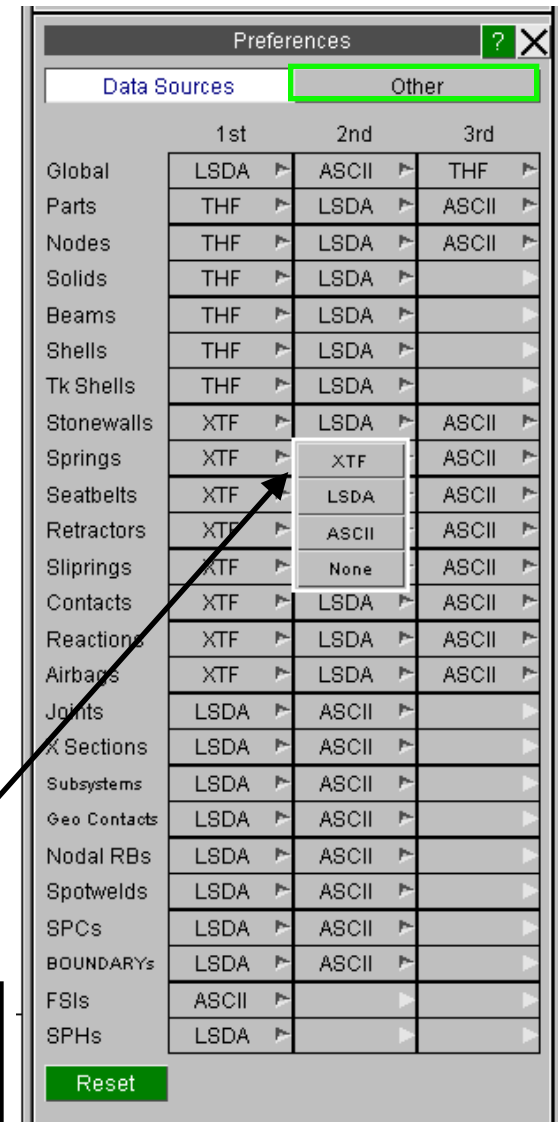
Click the entities. To select more than one, click on several, or SHIFT-click

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# Reading LS-DYNA results



- Many types of time-history data are available from more than one output file.
- The Settings menu defines which file to read first for each data type.
- The XTF file is not available for MPP LS-DYNA. It is recommended to use the LSDA (Binout) file instead.
- This menu affects the current session of T/HIS. Alternatively, these may be set in the Preferences (under Data Sources) for future use.
- Other settings (e.g. automatic regularisation before filtering) are accessible through 'Other'
- Note: THF = job.thf or d3thdt



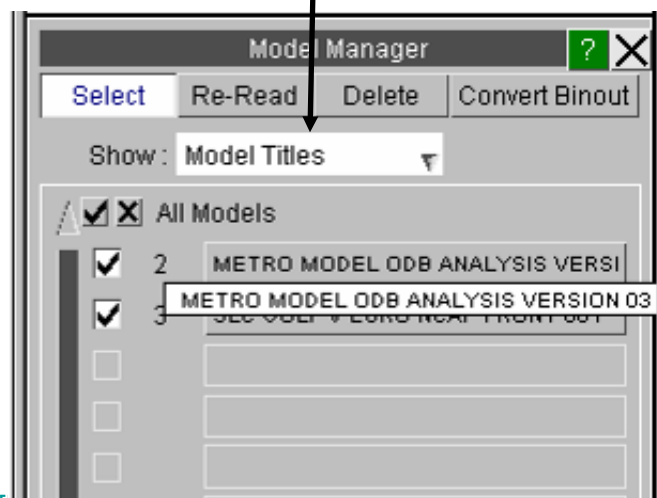
**Right click to select  
file type**

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# Working with multiple models

- T/HIS can keep several models open, and read data from them in one operation
- “Select Models” controls which models are available for reading data and identifies each model by title or by directory

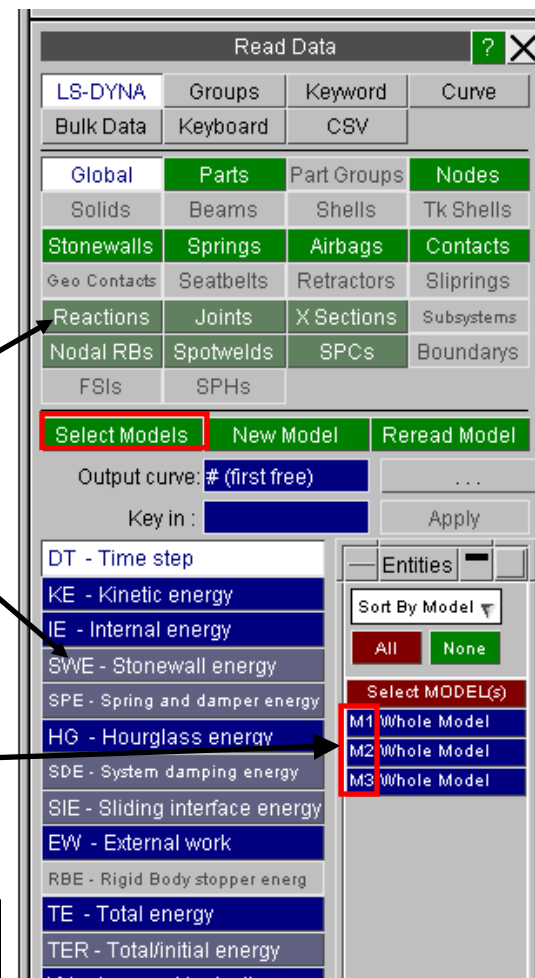
Change listing to  
‘Model Titles’ or  
‘Directories’



Fainter colour: not  
all models have  
this data

Object list includes  
model ID

Hover over text to see  
full directory / title



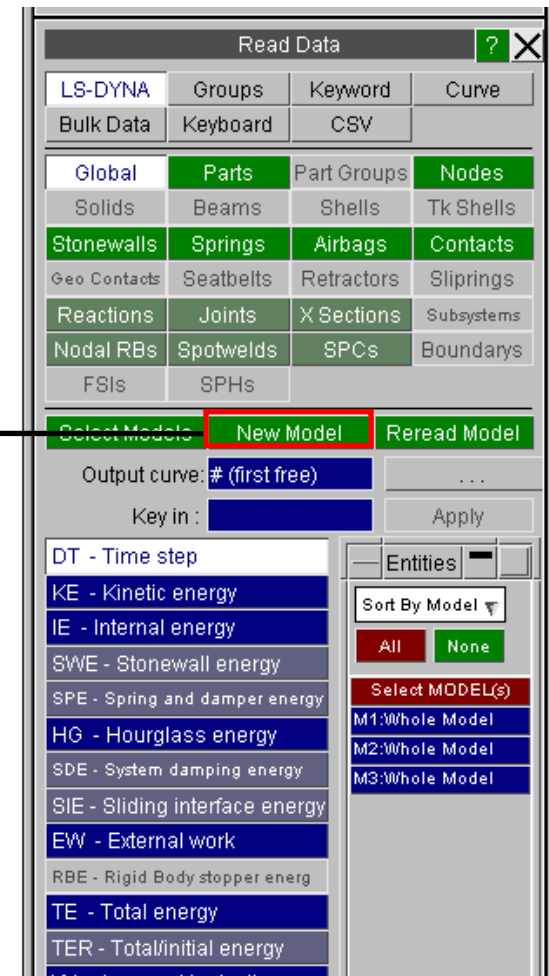
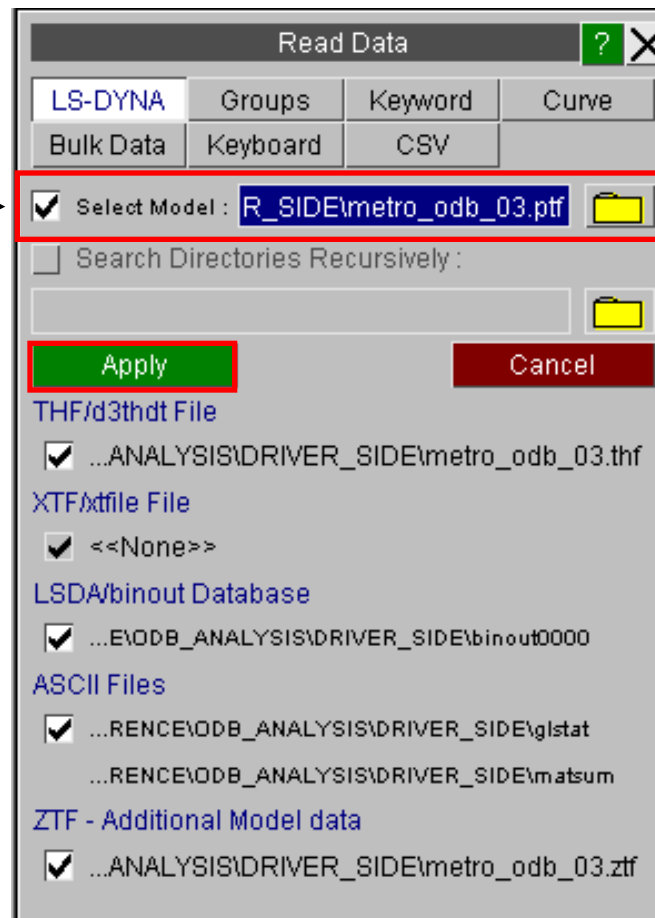
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# Working with multiple models

- To open multiple models, EITHER use the “New Model” button to open models one at a time...

**Browse for model**



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# Find models from directory

- ...Or load all models contained in a directory and any subdirectories in a single operation

The screenshot shows the 'Read Data' dialog box with the following settings:

- LS-DYNA** (selected)
- Groups** (selected)
- Keyword** (selected)
- Curve** (selected)
- Bulk Data** (selected)
- Keyboard** (selected)
- CSV** (selected)
- ☐ Select Model
- ☒ Search Directories Recursively :
- H:\DATA\DEMO\CRUSH** (selected directory)
- Apply** (button)
- Cancel** (button)
- ☒ THF/d3thdt File
- ☒ XTF/xtfile File
- ☒ LSDA/binout Databas
- ☒ ASCII Files
- ☒ All Models
- ☒ .ABASE
- ☒ .ARUN1
- ☒ .ARUN2
- ☒ .ARUN3
- ☒ .ARUN4

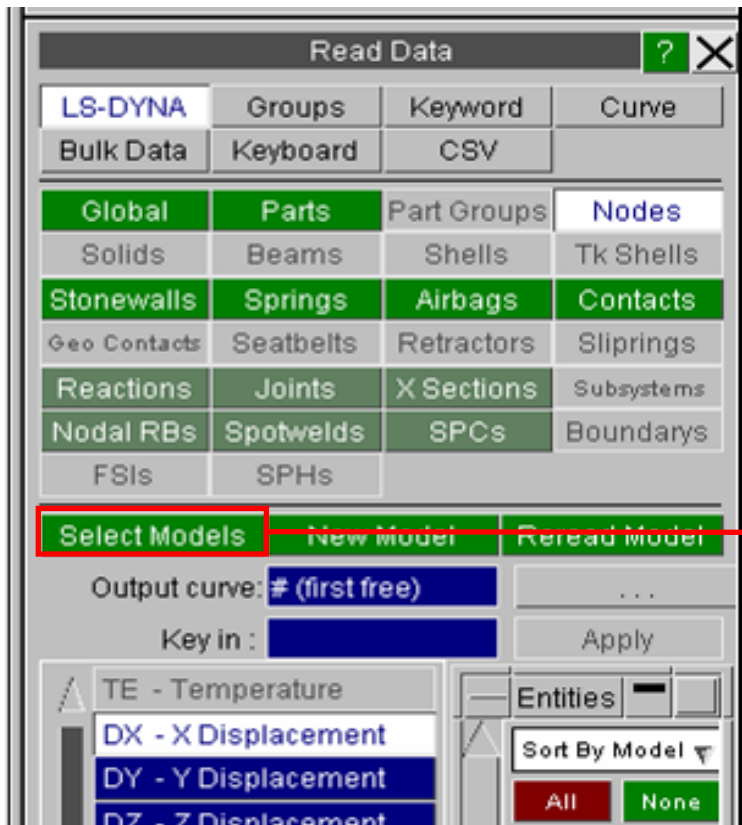
Annotations on the left side of the dialog box:

- Select root directory** (points to the directory field)
- Option to deselect result file types** (points to the file type checkboxes)
- Option to deselect models – default is to read all models found below the root directory** (points to the 'All Models' checkbox and the list of models)

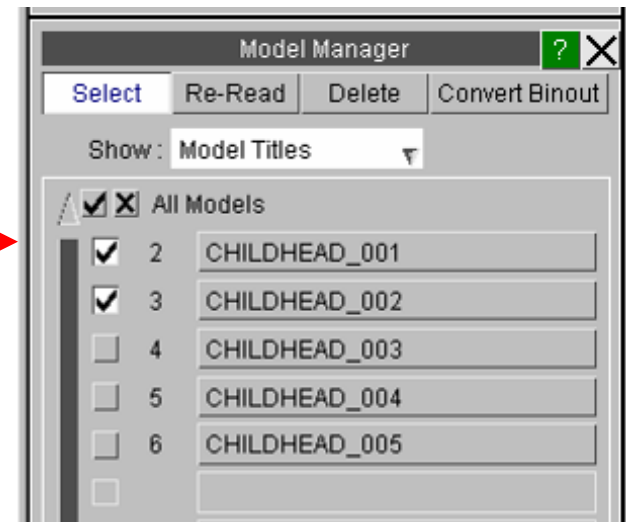
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# Selecting data from multiple models

- Filter entities by model through 'Model Manager' when reading data from LS-DYNA results files

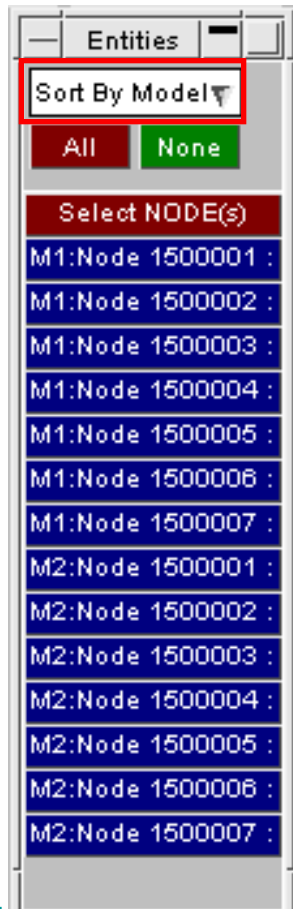


**Select active models  
to filter listings**



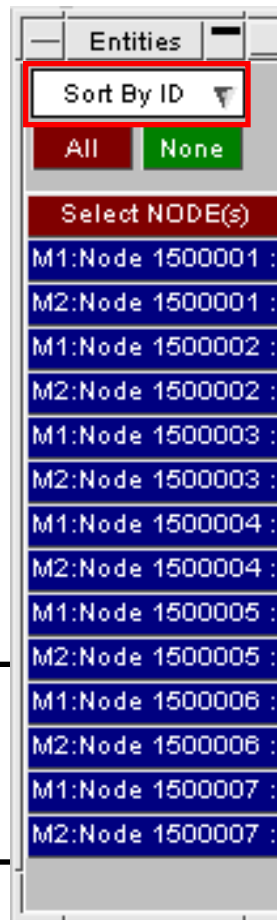
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- Different listing options are available for object list:

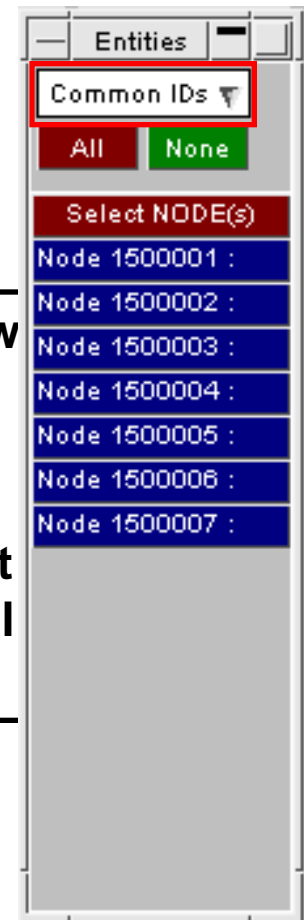


**Default:  
entities are  
ordered first  
by model,  
then by ID**

**Can sort by  
ID then by  
model**



**Common IDs – show  
entities that are  
present in all  
models; select  
entities from the list  
to read data from all  
models**



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- CSV (Excel-compatible) files may take one of the following formats:
  - X,Y,Y,Y: the x-axis values are in the first column
  - X,Y,X,Y,X,Y: the x-axis values are given separately for each curve, with the columns in X,Y pairs
  - X-axis values may be absent, in which case T/HIS can generate them at a constant user-specified interval
- Press READ to read in the file

Read Data

Read	Write	Curves	Models
Edit	Style	Command F	Images
Operate	Maths	Automotive	Seismic
Macros	FAST-TCF	Title/Axes	Display
Settings	Preferences	Menus	

LS-DYNA Groups Keyword Curve  
Bulk Data Keyboard **CSV**

File contains: 8 Column(s) x 2002 Row(s)

CSV File: \\MILLAU\\millau\_forced\_pitch.csv

Curve: # (first free)

File Format: X,Y,Y,Y,Y,Y,Y

X-AXIS

☒ Read X Values Column: 1  
☐ Generate X Values Start: 0.0000E+00  
Interval: 1.0000E+00

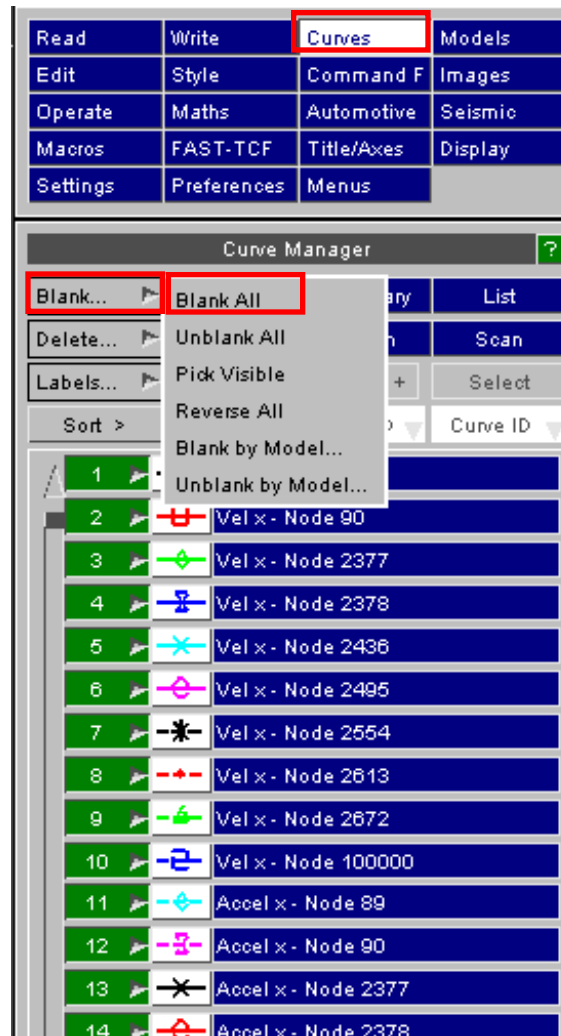
LABELS

☒ Read Labels Row: 1  
☐ Generate Labels Column #

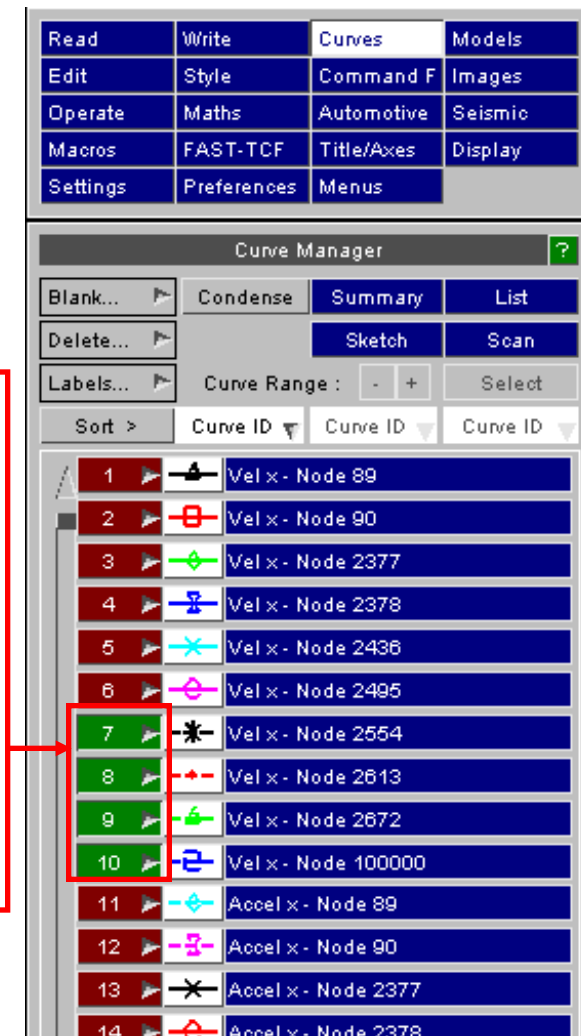
Read



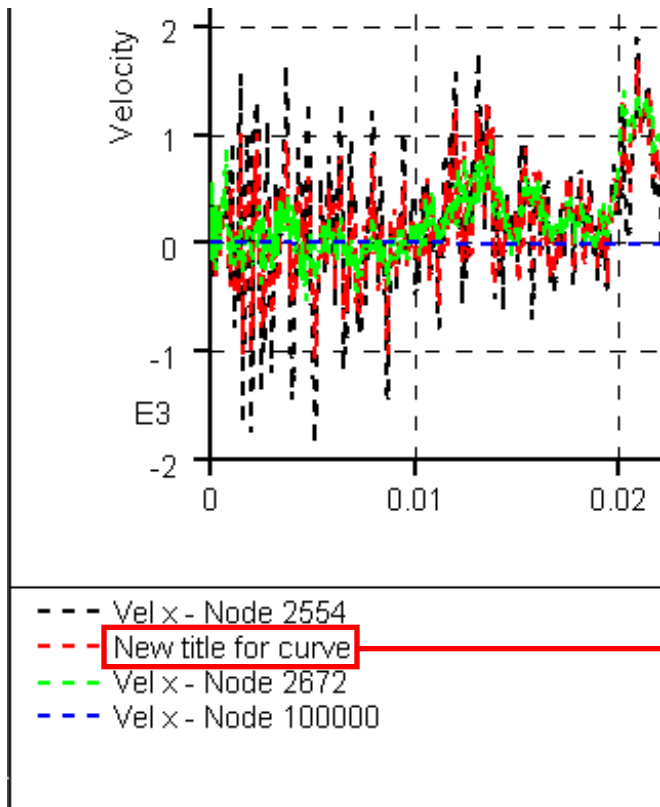
Control of curve blanking from drop-down menu



Or click on individual red/green buttons (red=blanked). To blank a range of curves, click the first, shift-click the last

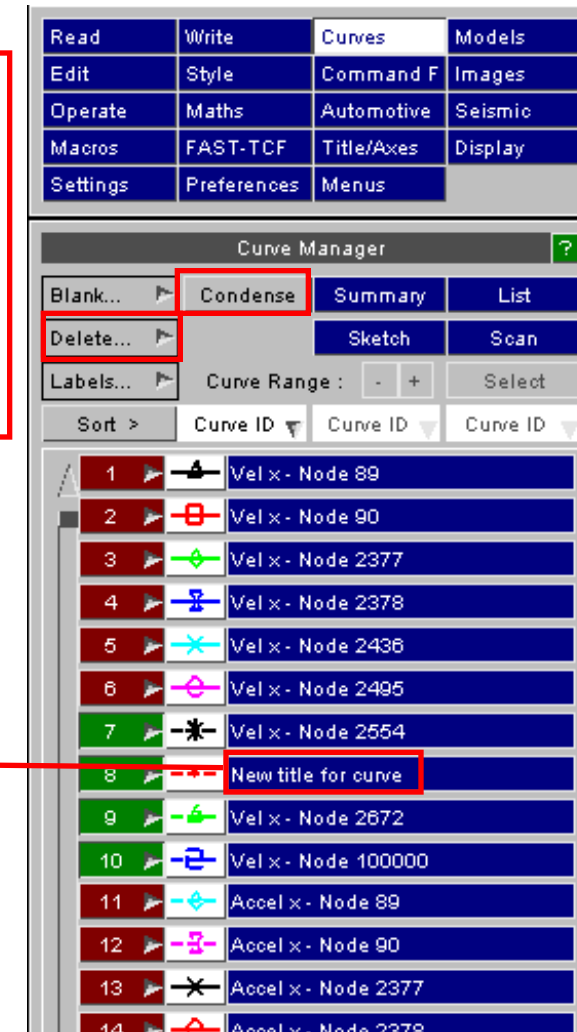


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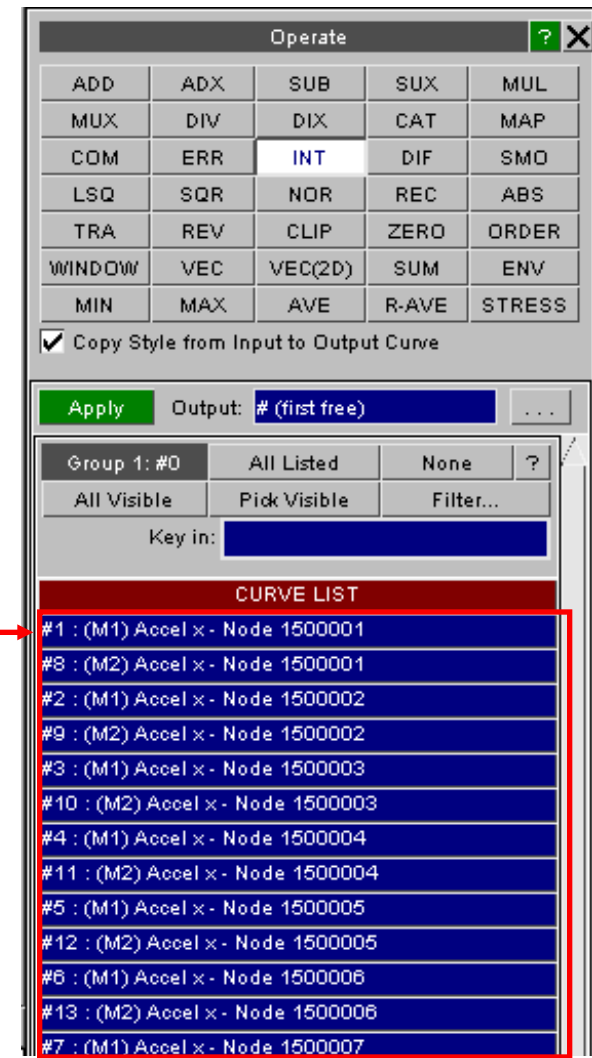
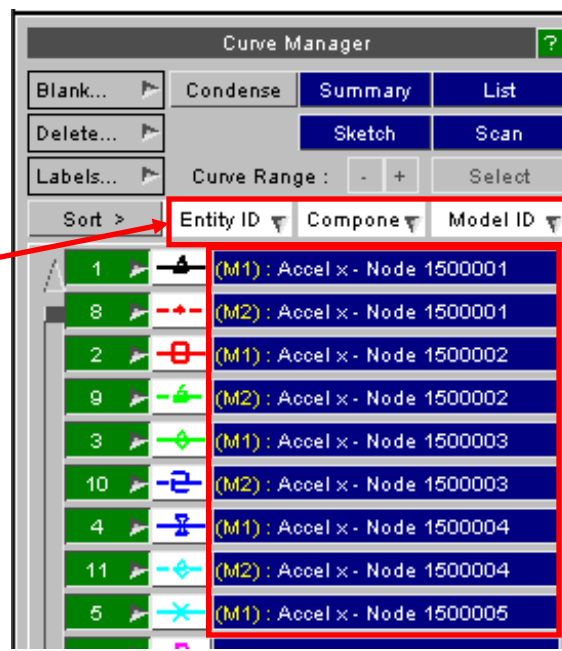
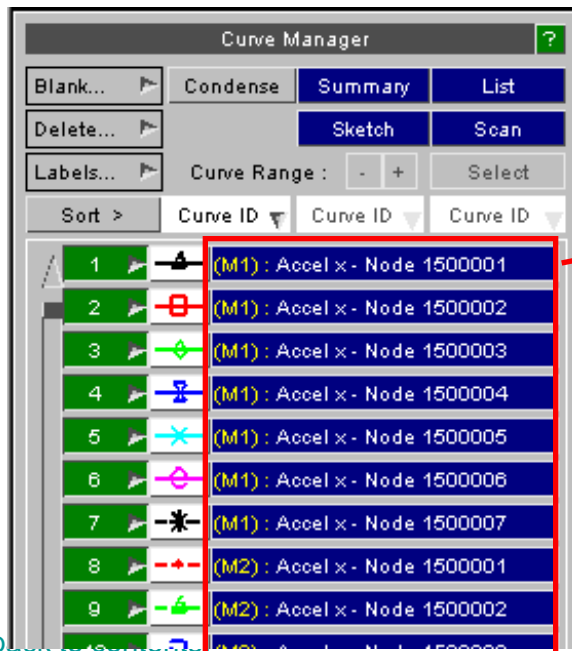
Use drop-down menu to delete selected curves. Condense then removes gaps left by the deleted curves.

Curve manager can also be used to change curve "line labels"



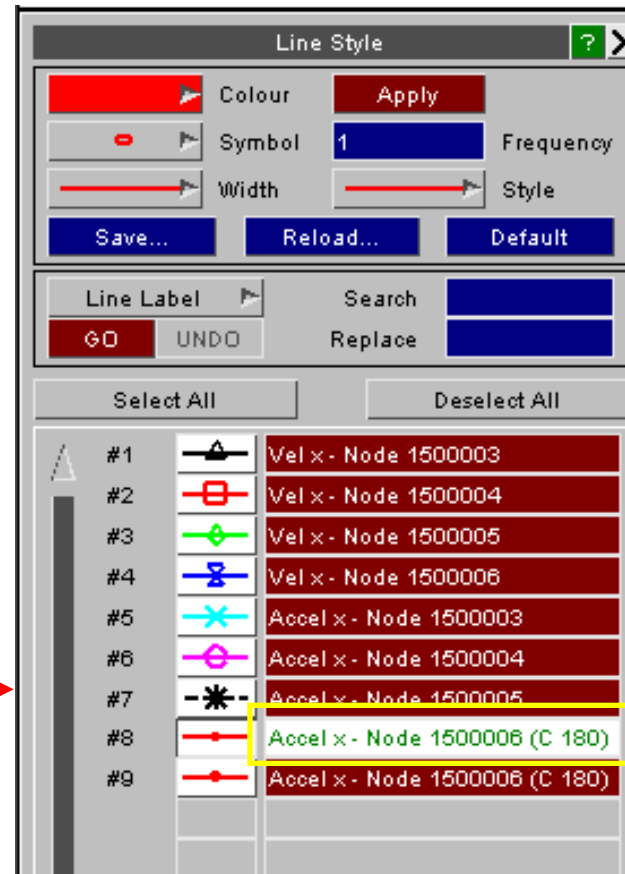
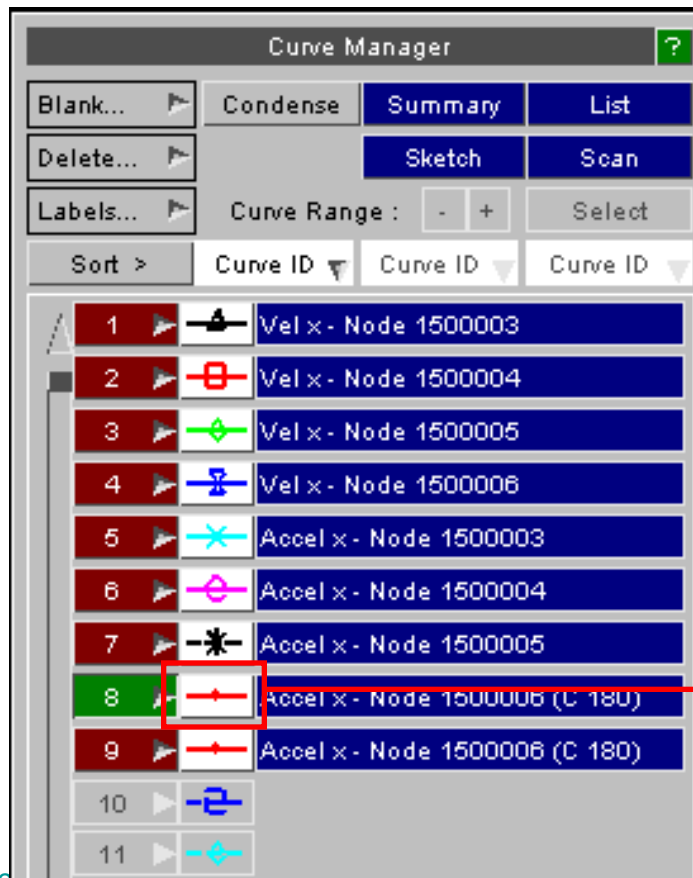
# Curve Manager - Sorting curves

- Options are available for sorting the curves in the curve menu – this can help with blanking etc.
- The sorting options selected here also apply to curve lists, e.g. in the Operate menu.
- E.g. sort by Entity ID then by Component then by Model



# Curve Manager – Curve styles

- The appearance of curves can be changed using the curve style menu. This menu can be activated by either clicking on the Style button in the curve manager or from the top menu.



After selecting colour/style etc, press Apply.

The highlighted curves will be changed

- T/HIS has 30 pre-defined colours.
- 6 user defined colours can be created via the oa\_pref preference file.



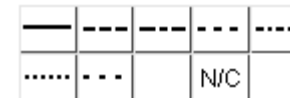
- Different symbols can be used to mark points:



- Different line widths:



- Different line styles:

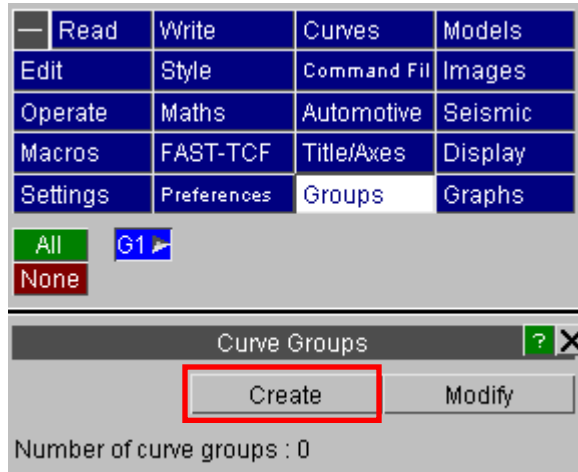


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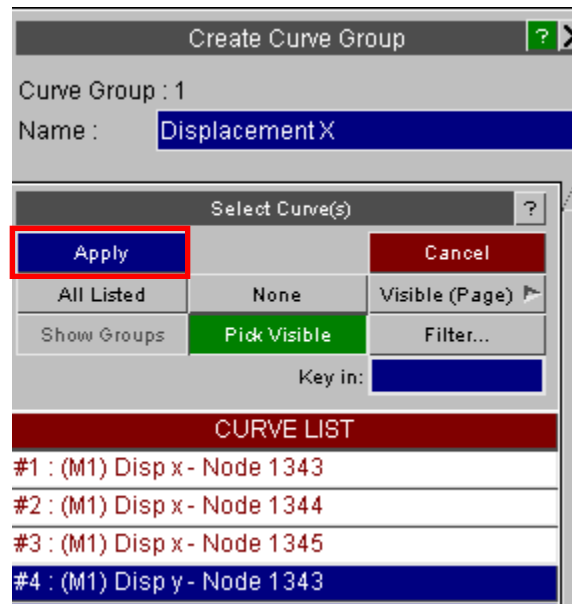


# Curve Manager – Curve styles

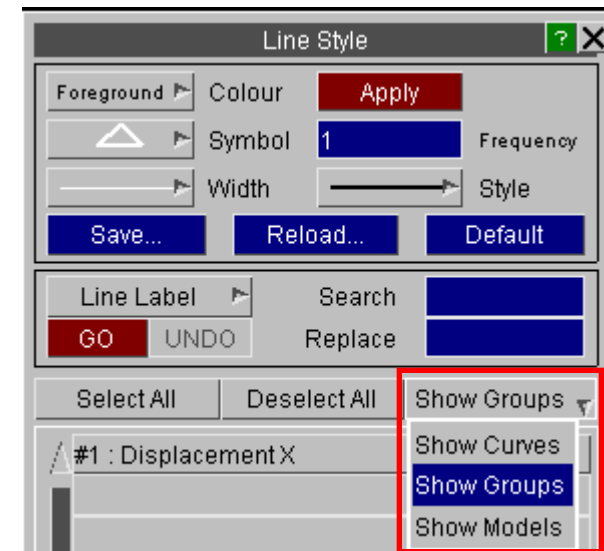
- Curve styles can be applied to groups of curves.



**Create the group.**

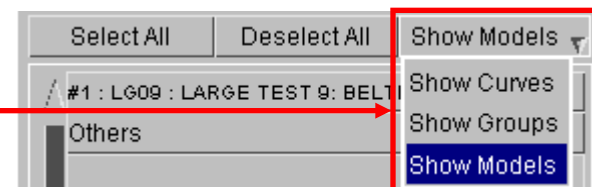


**Choose the curves to add to the group.**



**Show the groups and apply the style.**

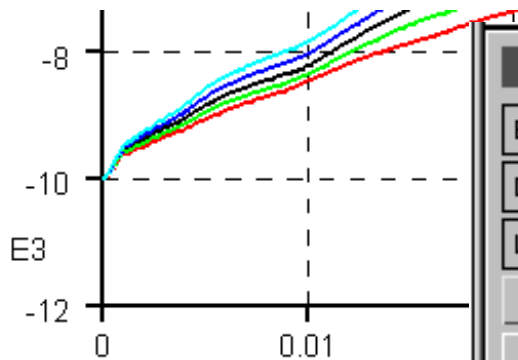
- Styles can also be applied by model.



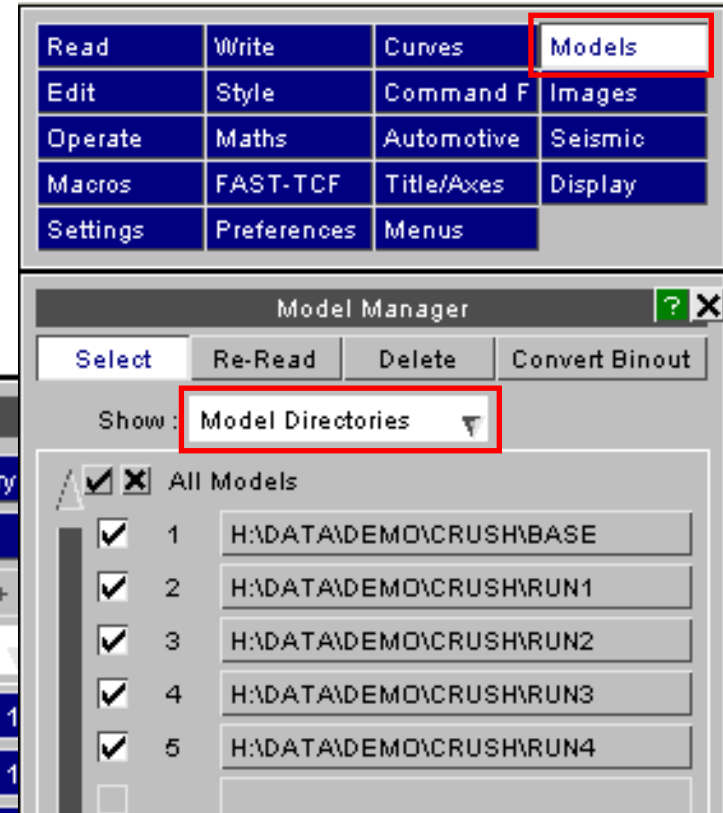
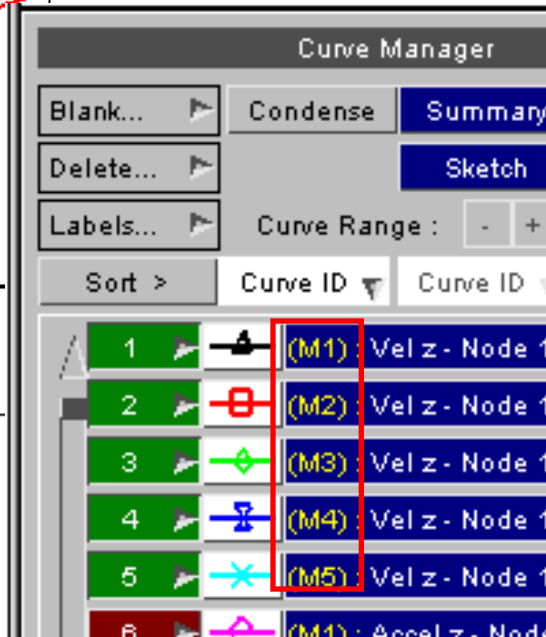
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# Curve Manager - Model prefix

- By default, T/HIS identifies the model from which each curve originates using M1, M2, M3...
- The identity of M1, M2, M3 etc can be found from the Models menu...

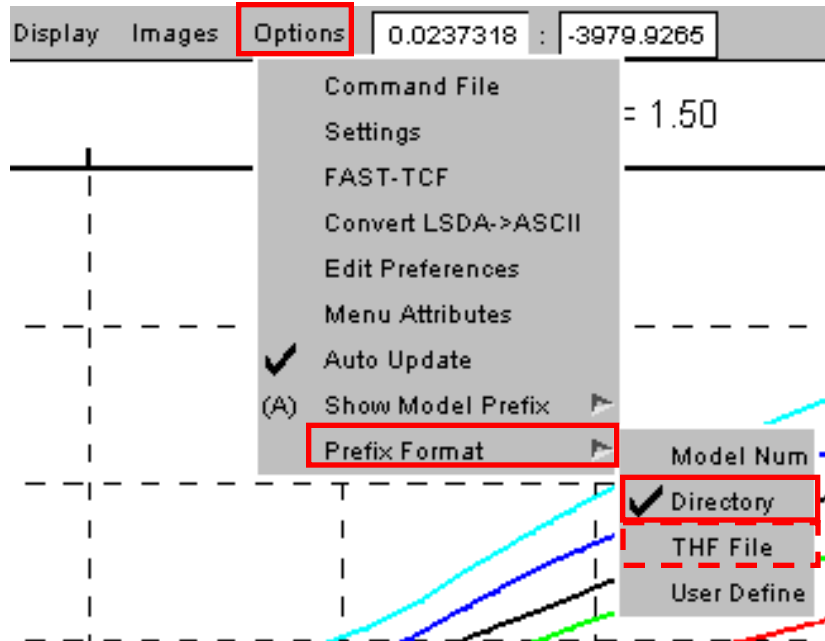


(M1) Vel z - Node 100000  
(M2) Vel z - Node 100000  
(M3) Vel z - Node 100000  
(M4) Vel z - Node 100000  
(M5) Vel z - Node 100000



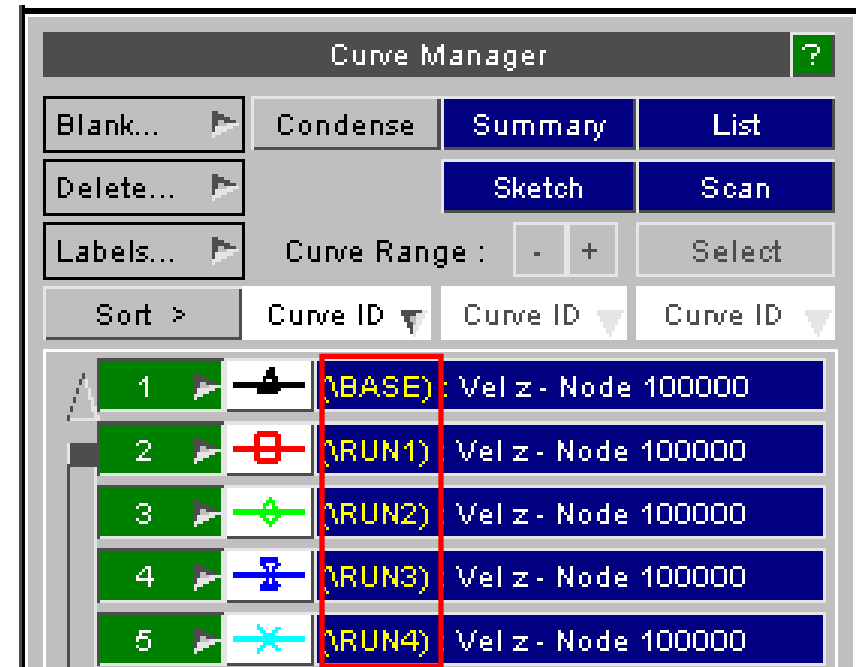
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# Curve Manager - Model Prefix



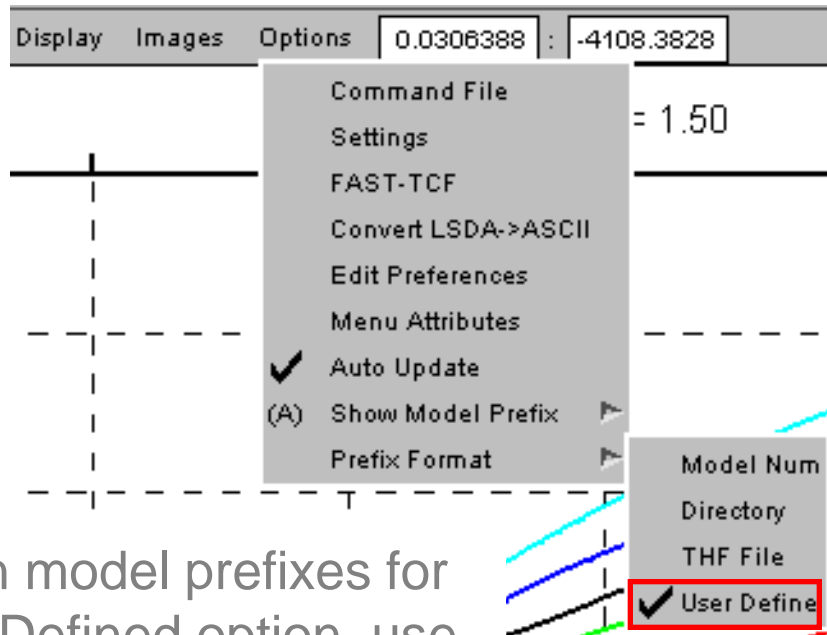
- The prefix can be changed to show the subdirectory containing each model,
- Another alternative is to use the root name of the THF file, e.g. **base.thf**

(\BASE) : Vel z - Node 100000  
(\RUN1) : Vel z - Node 100000  
(\RUN2) : Vel z - Node 100000  
(\RUN3) : Vel z - Node 100000  
(\RUN4) : Vel z - Node 100000



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# Curve Manager - Model Prefix



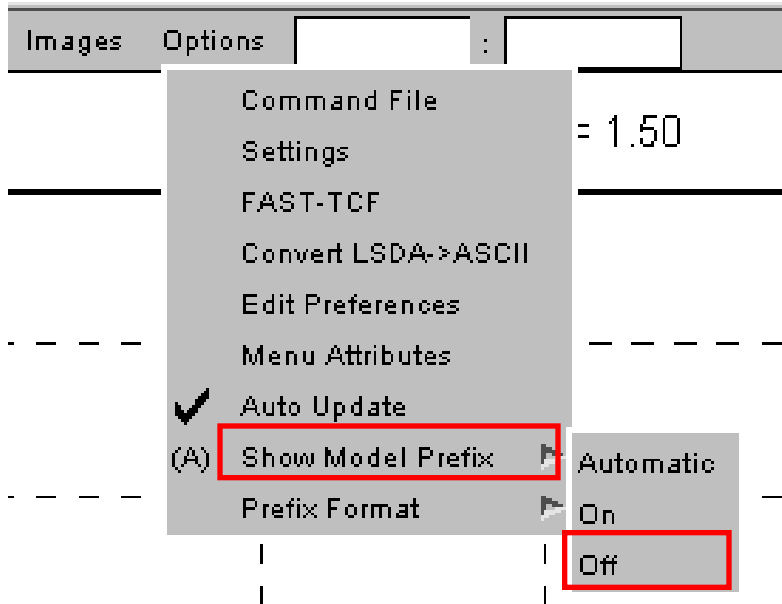
- To type in model prefixes for the User Defined option, use the Model menu, click on the model, type in the prefix.

(test model 1) : Vel z - Node 100000  
(M2) : Vel z - Node 100000  
(M3) : Vel z - Node 100000  
(M4) : Vel z - Node 100000  
(M5) : Vel z - Node 100000

Read	Write	Curves	Models
Edit	Style	Command F	Images
Operate	Maths	Automotive	Seismic
Macros	FAST-TCF	Title/Axes	Display
Settings	Preferences	Menus	

Model Manager	
Select	Re-Read Delete Convert Binout
Show: Model Directories	
All Models	
1	H:\DATA\DEMO\CRUSH\BASE
2	H:\DATA\DEMO\CRUSH\RUN1
3	H:\DATA\DEMO\CRUSH\RUN2

Model Manager	
Title	BASE T = 1.50
Directory	H:\DATA\DEMO\CRUSH\BASE
Prefix	test model 1
THF/d3thdt	base.thf
XTF/xtfile	<NONE>
LSDA/binout	<NONE>
ASCII	Present

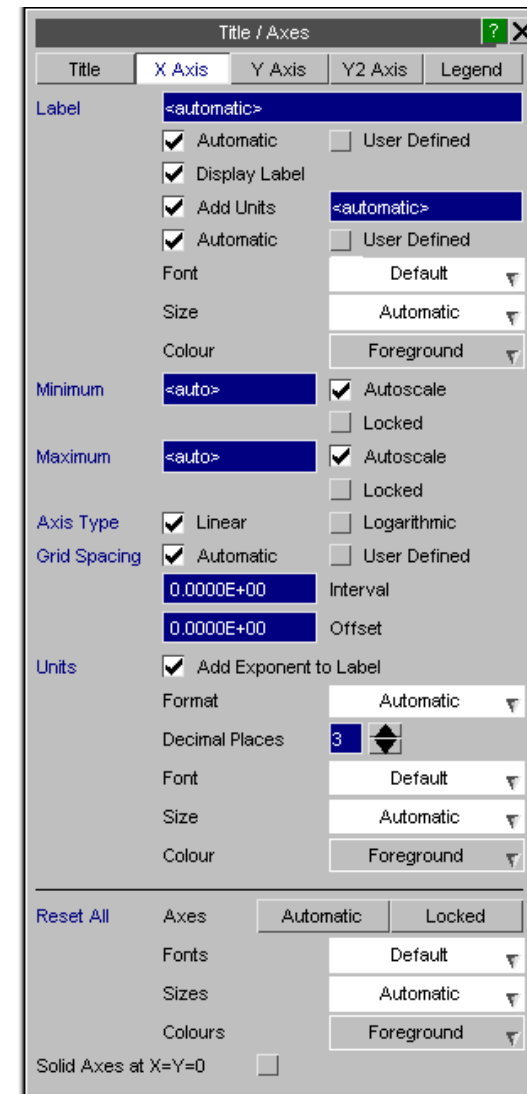
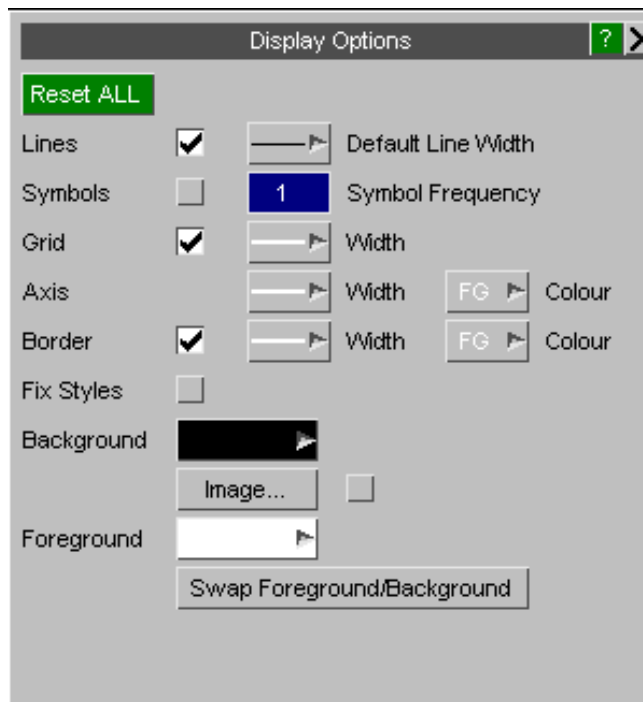


- Model prefixes can be turned off here.
- “Automatic” means show model prefixes only when multiple models are present.
- The prefix format may be set by a preference (prefix\_format)



# Graph Properties

- The appearance of each graph can be modified using the Display menu and the Title/Axes menu.

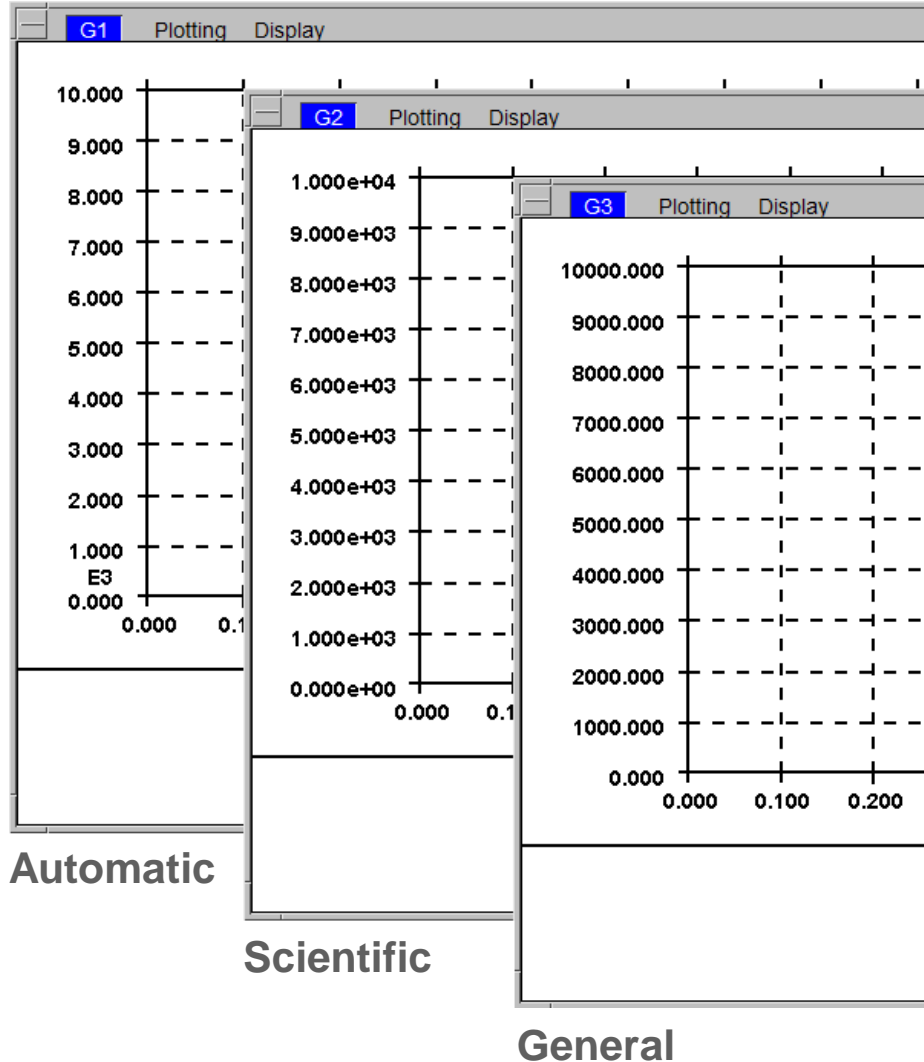


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# Graph Properties – Axis and Legend

Oasys

T/HIS



Axis values can be displayed using 3 different formats, Automatic Scientific and General.

In Automatic mode T/HIS only uses E3, E6, E9 etc.

The dialog box shows the following settings:

- Automatic** (checked), **User Defined** (unchecked)
- Display Label** (checked)
- Font:** Helvetica Bold
- Size:** 8 point
- Colour:** Foreground
- Minimum:** 0.0000E+00
- Maximum:** 1.0000E+04
- Axis Type:** Linear (checked), Logarithmic (unchecked)
- Grid Spacing:** Automatic (checked), User Defined (unchecked)
- Units:** Format: Automatic (selected in the dropdown menu), Decimal P: Automatic, Font: Automatic, Size: Automatic, Colour: Foreground

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Oasys

LS-DYNA ENVIRONMENT

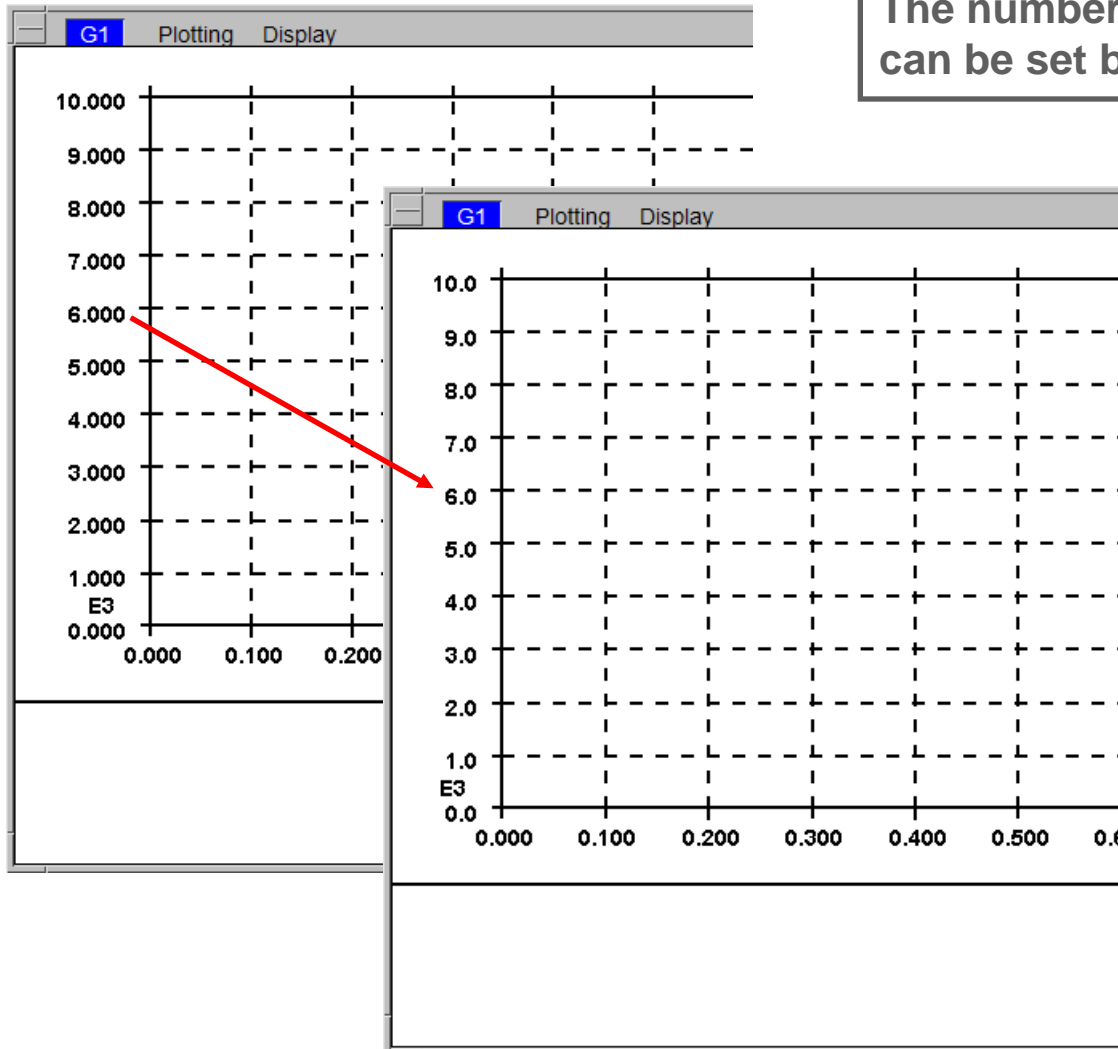
ARUP

# Graph Properties – Axis and Legend

Oasys

T/HIS

The number of decimal places displayed can be set between 0 and 9.



The Oasys Title / Axes dialog box is shown with the 'Y Axis' tab selected. The 'Label' is set to '<automatic>'. The 'Automatic' checkbox is checked. The 'Display Label' checkbox is checked. The 'Font' is set to 'Helvetica Bold' and the 'Size' is 8 point. The 'Colour' is 'Foreground'. The 'Minimum' is 0.0000E+00 and the 'Maximum' is 1.0000E+04. The 'Axis Type' is 'Linear'. The 'Grid Spacing' is 'Automatic'. The 'Units' section shows 'Format' set to 'Automatic' and 'Decimal Places' set to 3, which is highlighted with a red box. The 'Font' is 'Helvetica Bold' and the 'Size' is 8 point.

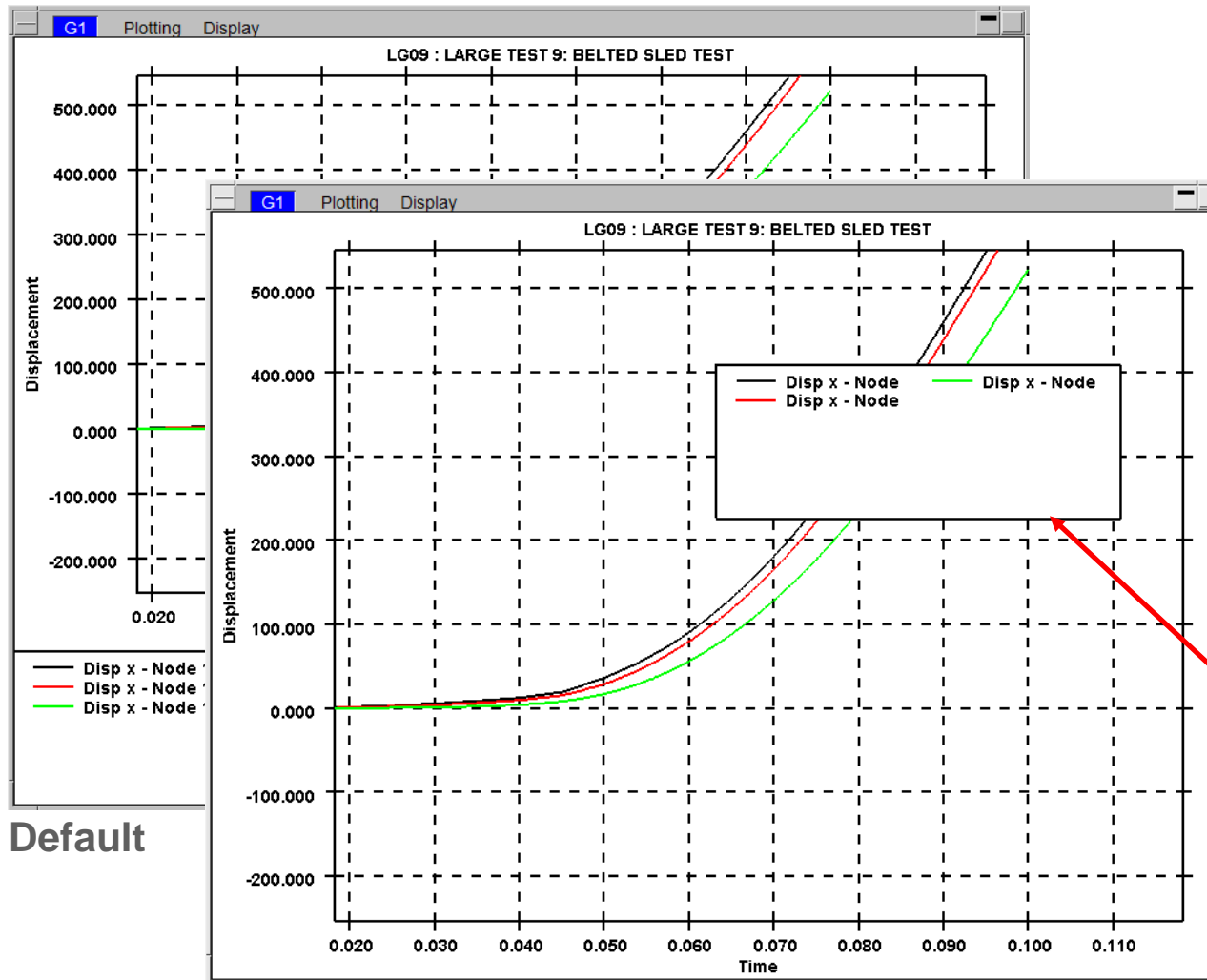
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Oasys

LS-DYNA ENVIRONMENT

ARUP

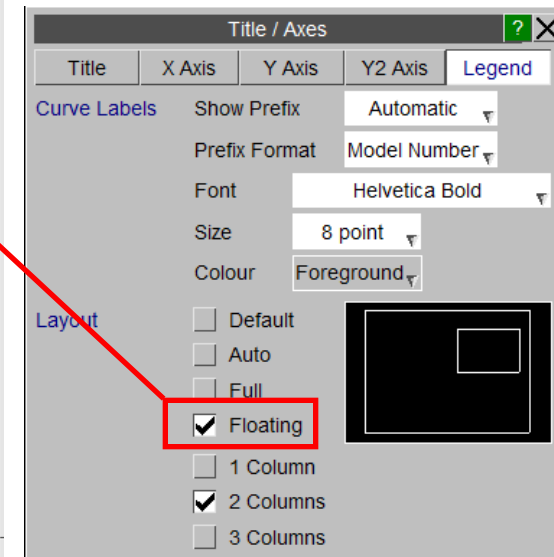
# Graph Properties – Axis and Legend



Graph Legend can now be positioned anywhere using the “Floating” option

Can also access this menu by right-click on legend

Legend can be dragged to position or resize



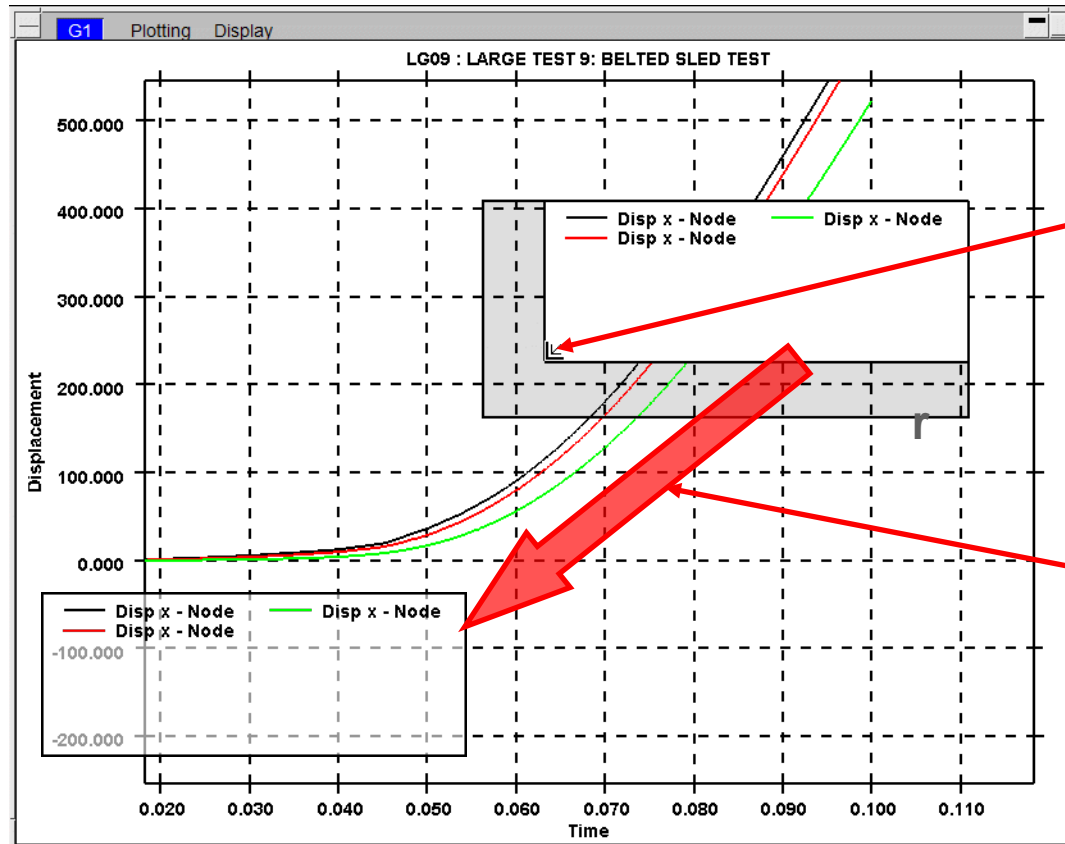
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# Graph Properties – Axis and Legend

Oasys

T/HIS

- The size and position of a “floating” legend can be modified interactively



Click on legend border and drag to resize

Click inside legend and drag to reposition

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Oasys

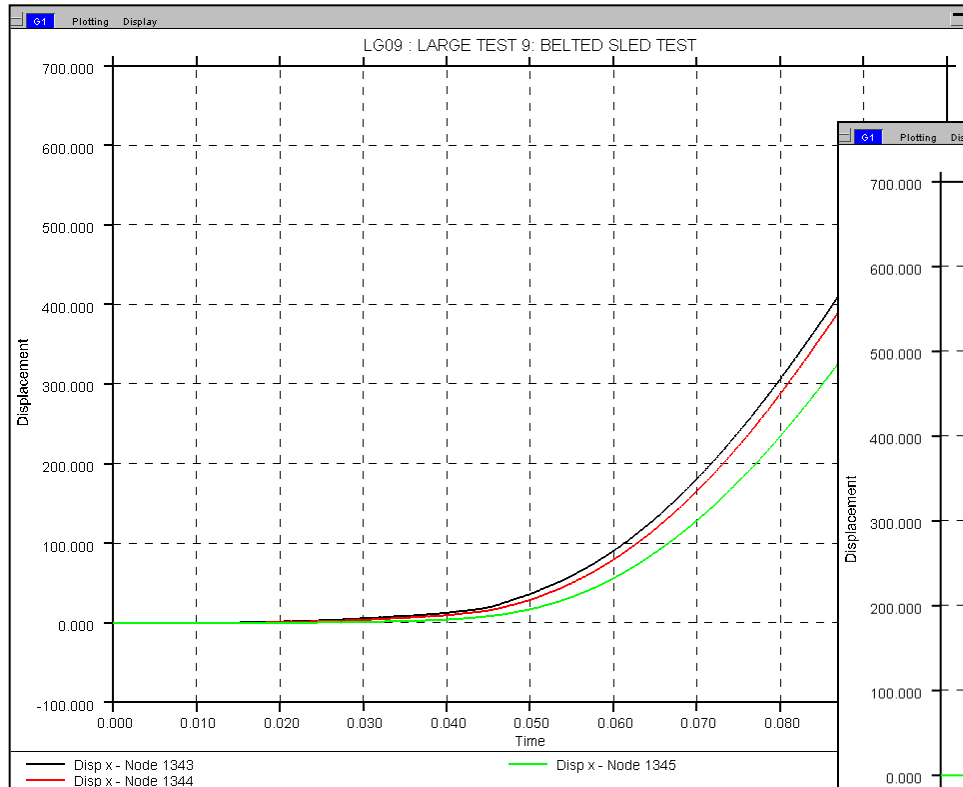
LS-DYNA ENVIRONMENT

ARUP

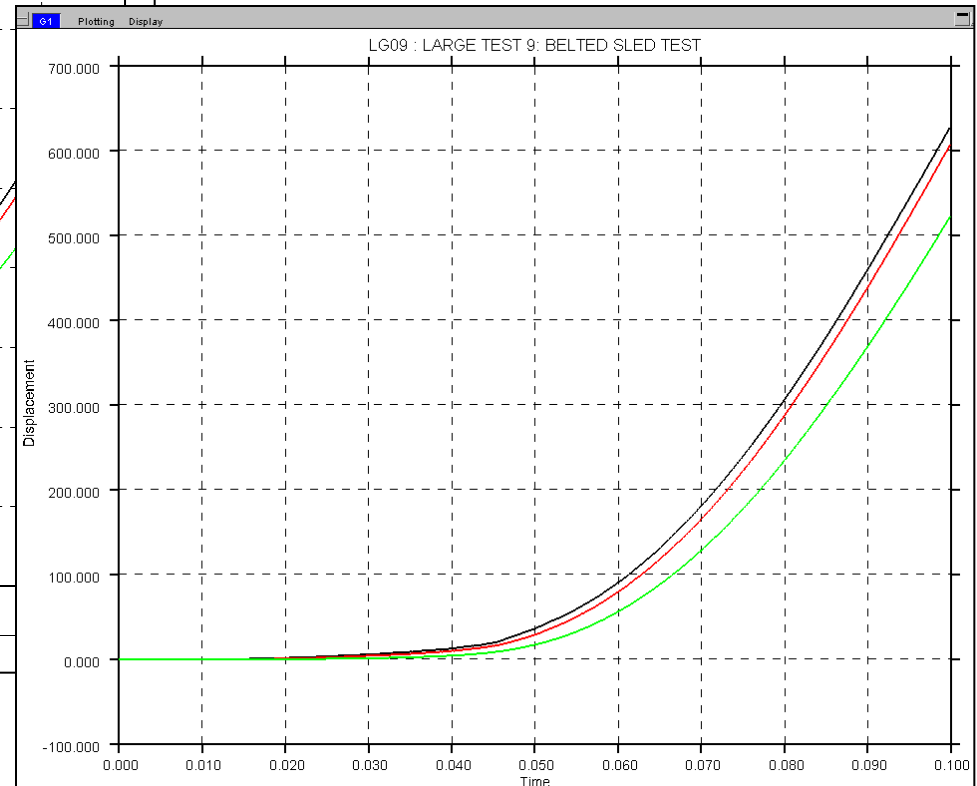


# Graph Properties – Axis and Legend

- Other legend types:



Auto



Full

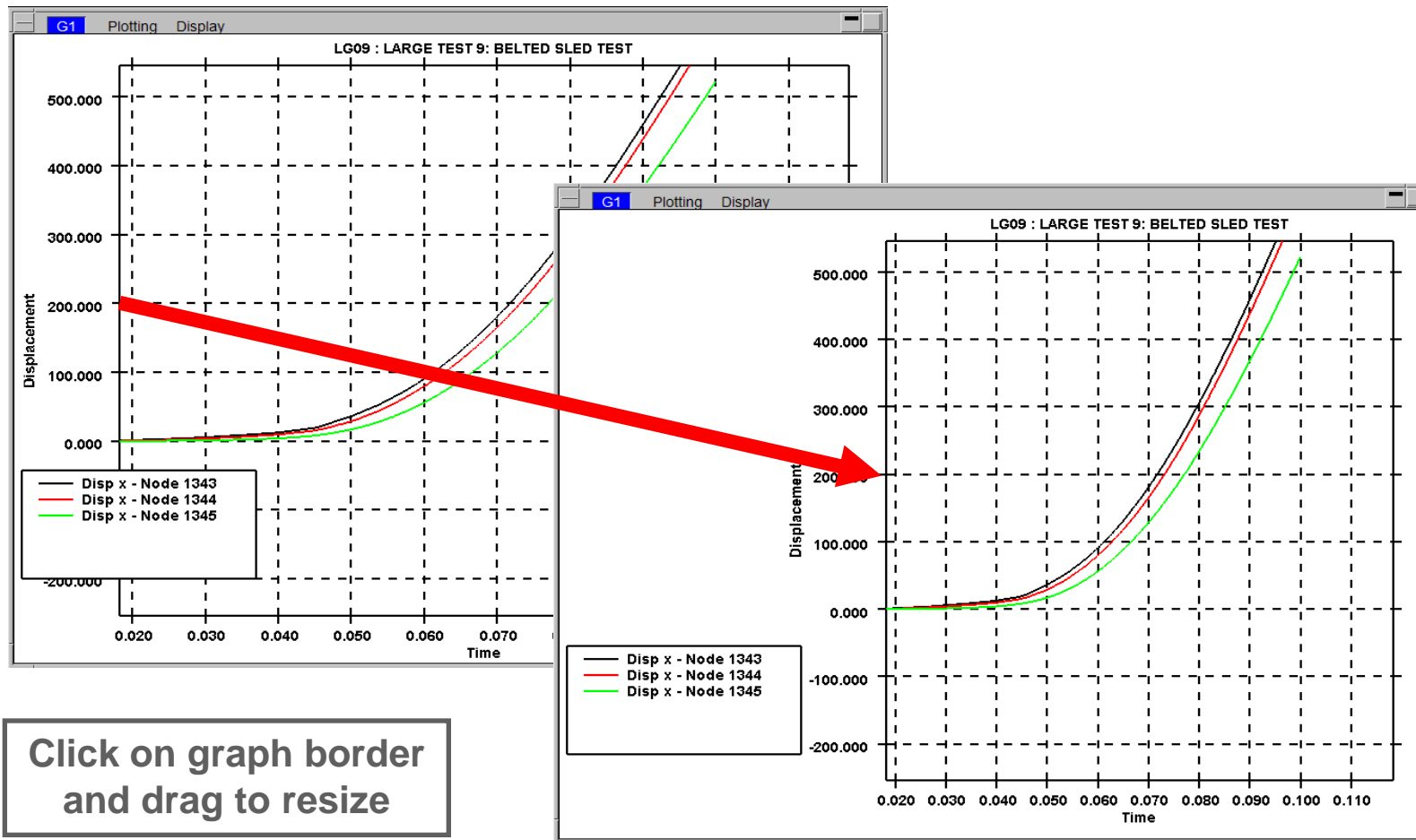
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# Graph Properties – Axis and Legend

Oasys

T/HIS

- The position of a each axis can also be modified interactively



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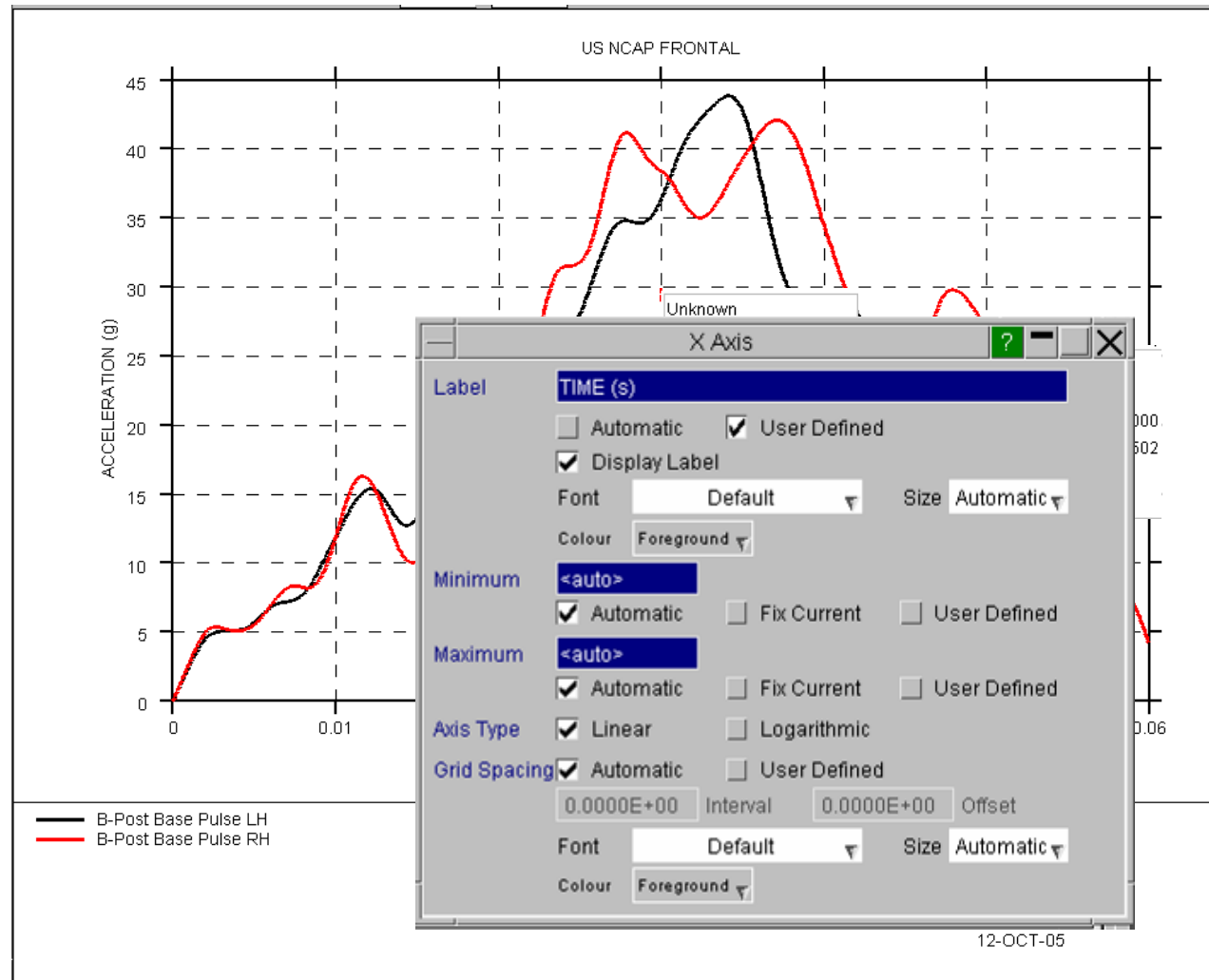
Oasys

LS-DYNA ENVIRONMENT

ARUP

# Graph Properties – Axis and Legend

- The axis and legend menus can also be accessed by clicking on either an axis or within the legend area.

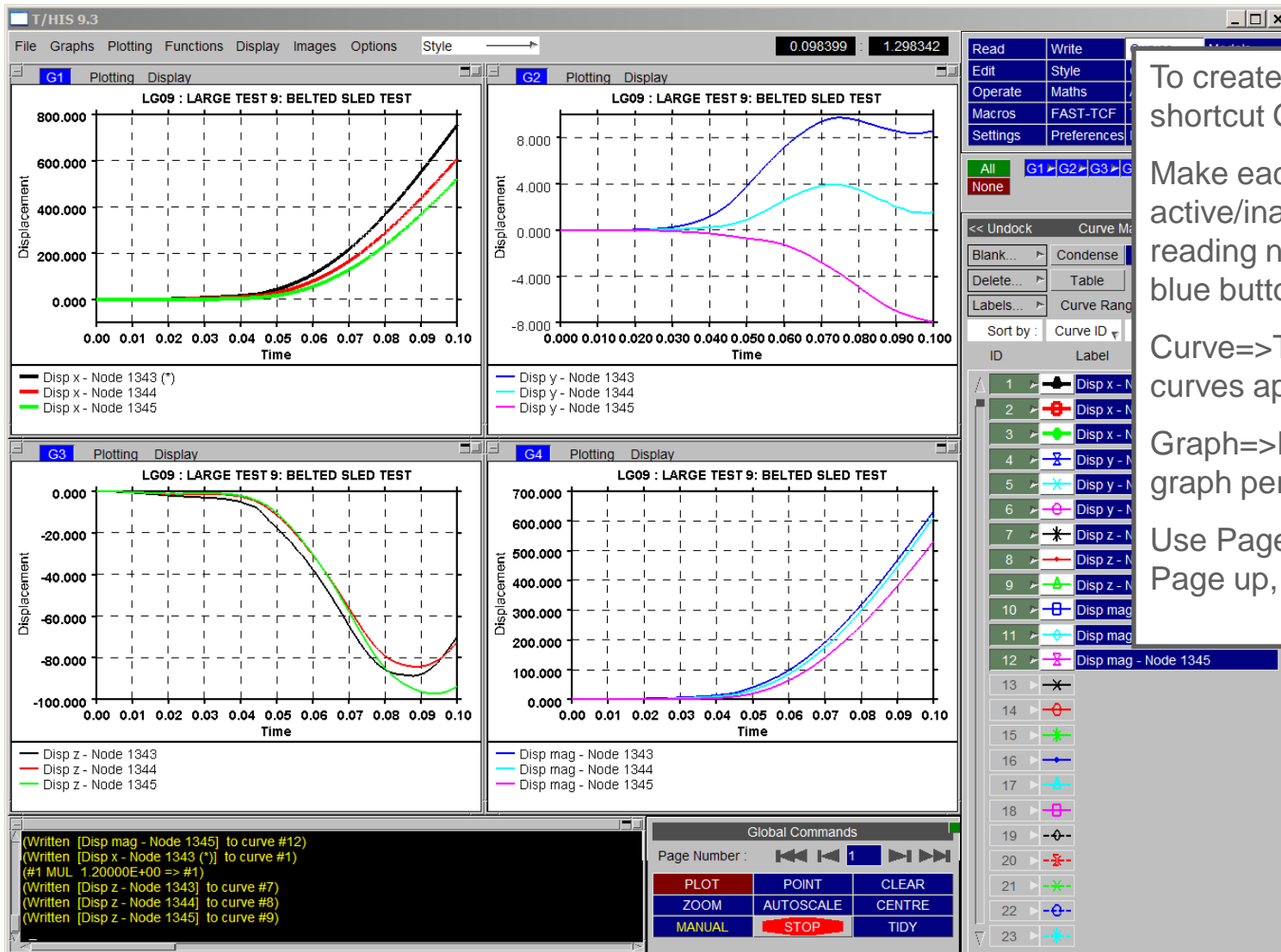


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- T/HIS can contain up to 32 separate graphs.
- These graphs can be arranged in any combination on up to 32 pages.
- The contents and display of each graph can be controlled either individually or changes can be applied to multiple graphs.

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# Multiple graphs



To create a new graph, shortcut G

Make each graph active/inactive (e.g. when reading new data) using the blue buttons G1, G2, etc

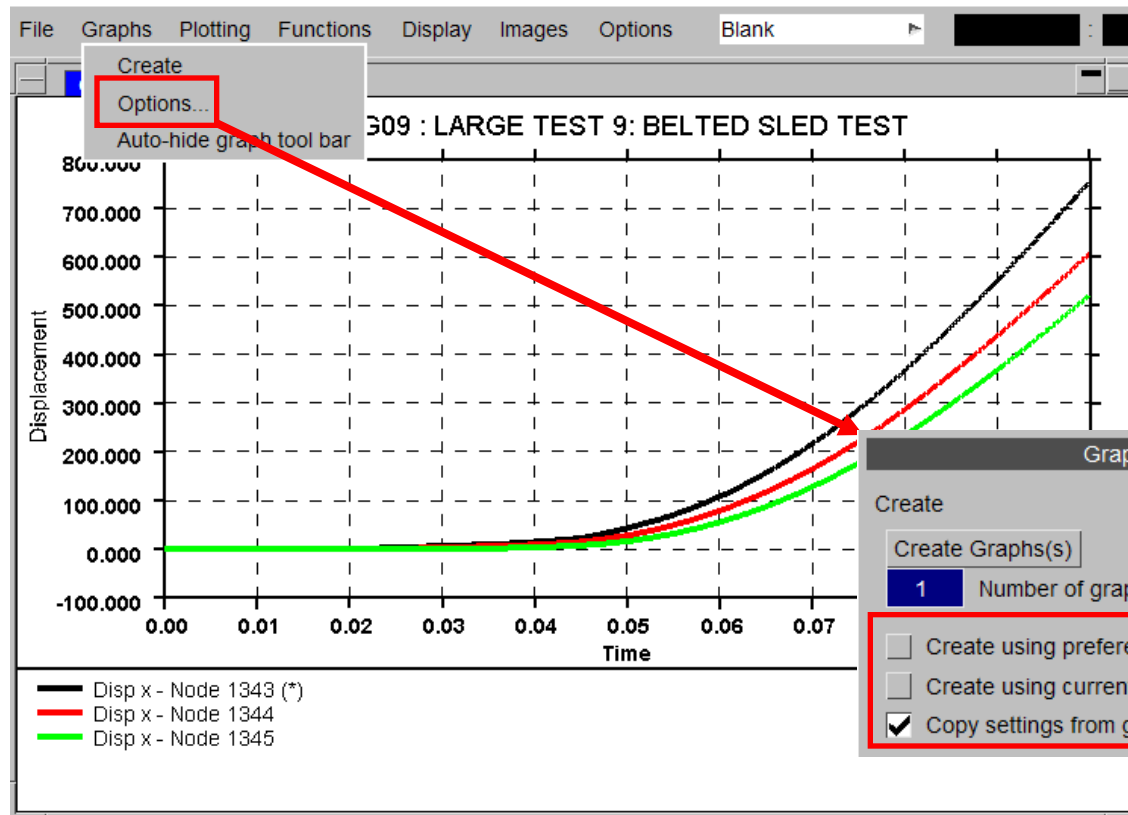
Curve=>Table to control which curves appear in which graph

Graph=>Layout to select 1 graph per page, 2x2, etc

Use Page Number controls or Page up, Page down buttons



# Multiple graphs



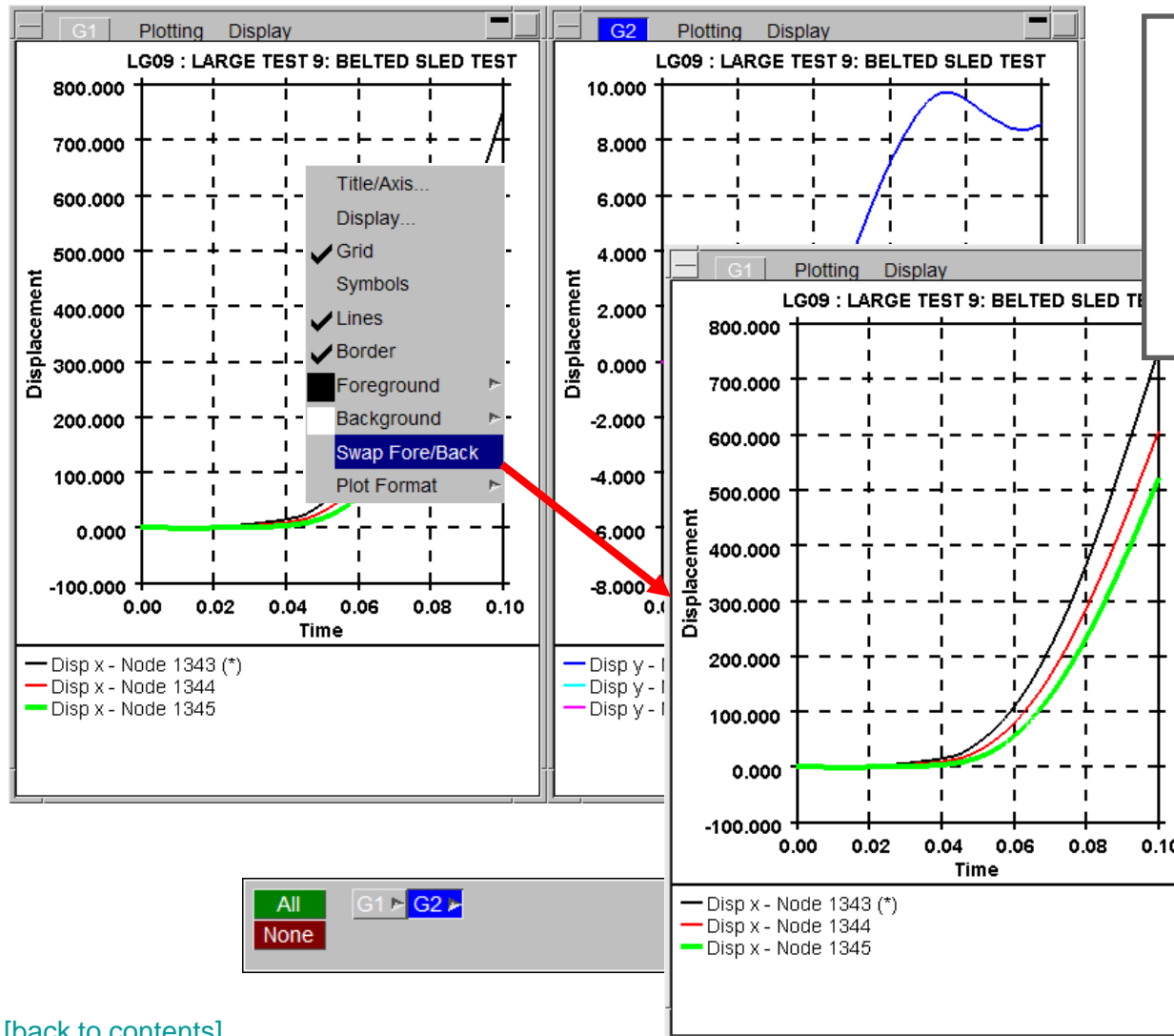
The initial display and axis settings for new graphs can be copied from 3 possible sources.

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# Multiple graphs

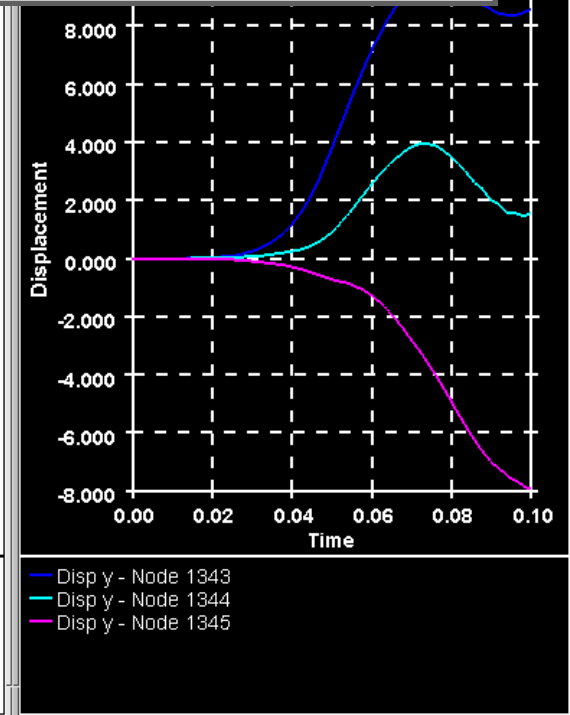
Oasys

T/HIS



Make each graph active or inactive: only the active graphs respond to menu commands

e.g. reverse background/foreground



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Oasys

LS-DYNA ENVIRONMENT

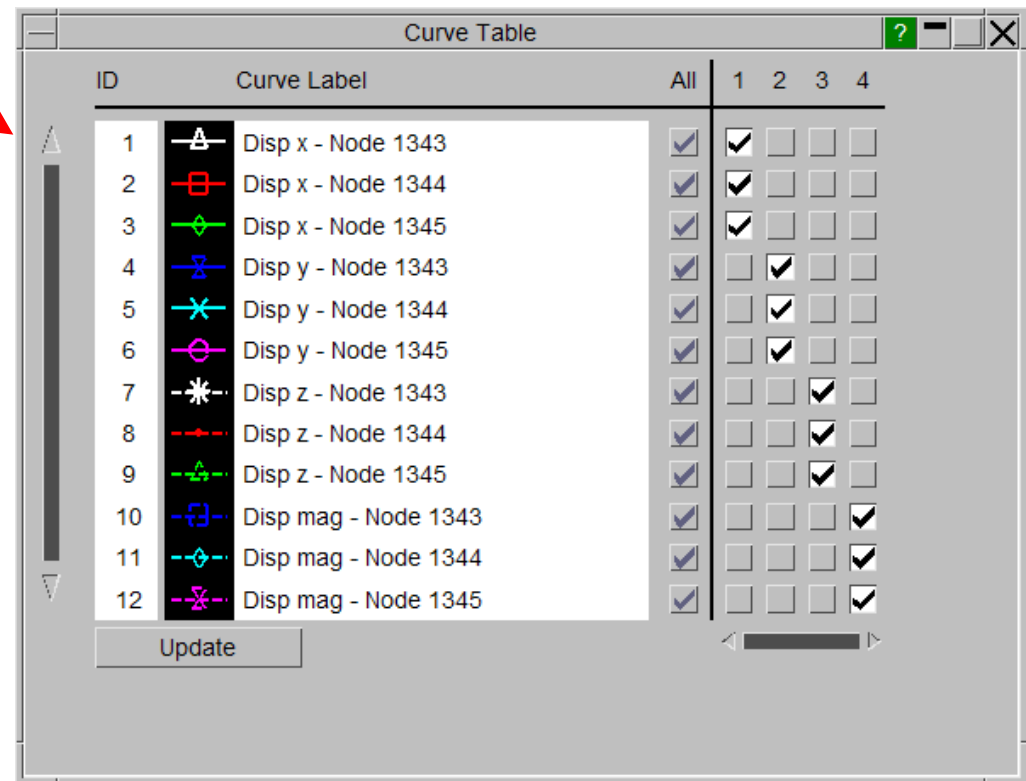
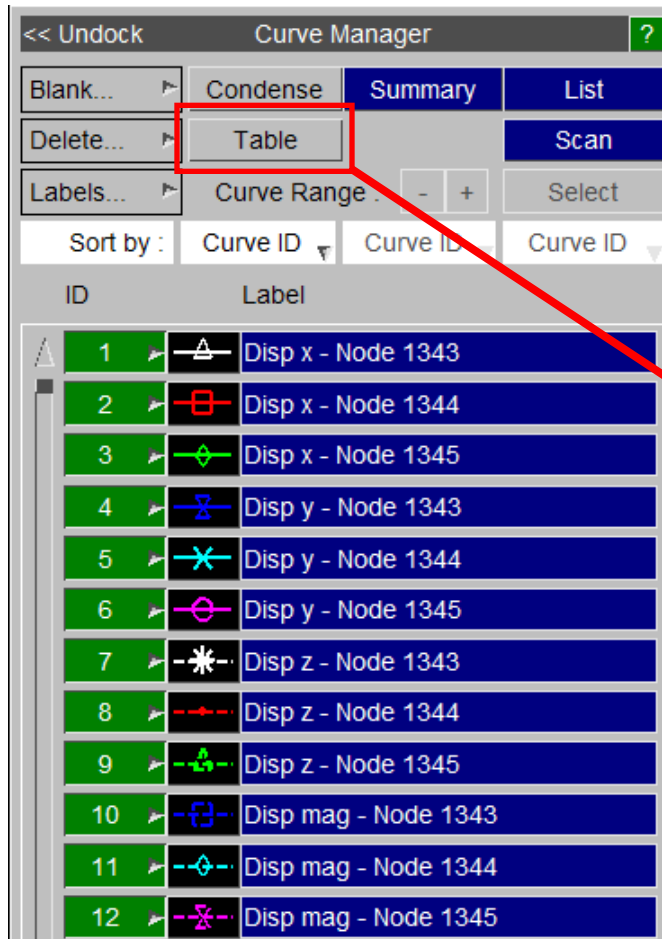
ARUP

# Multiple graphs

Oasys

T/HIS

To control which curves appear in which graphs, use the Table menu from the Curves menu...



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Oasys

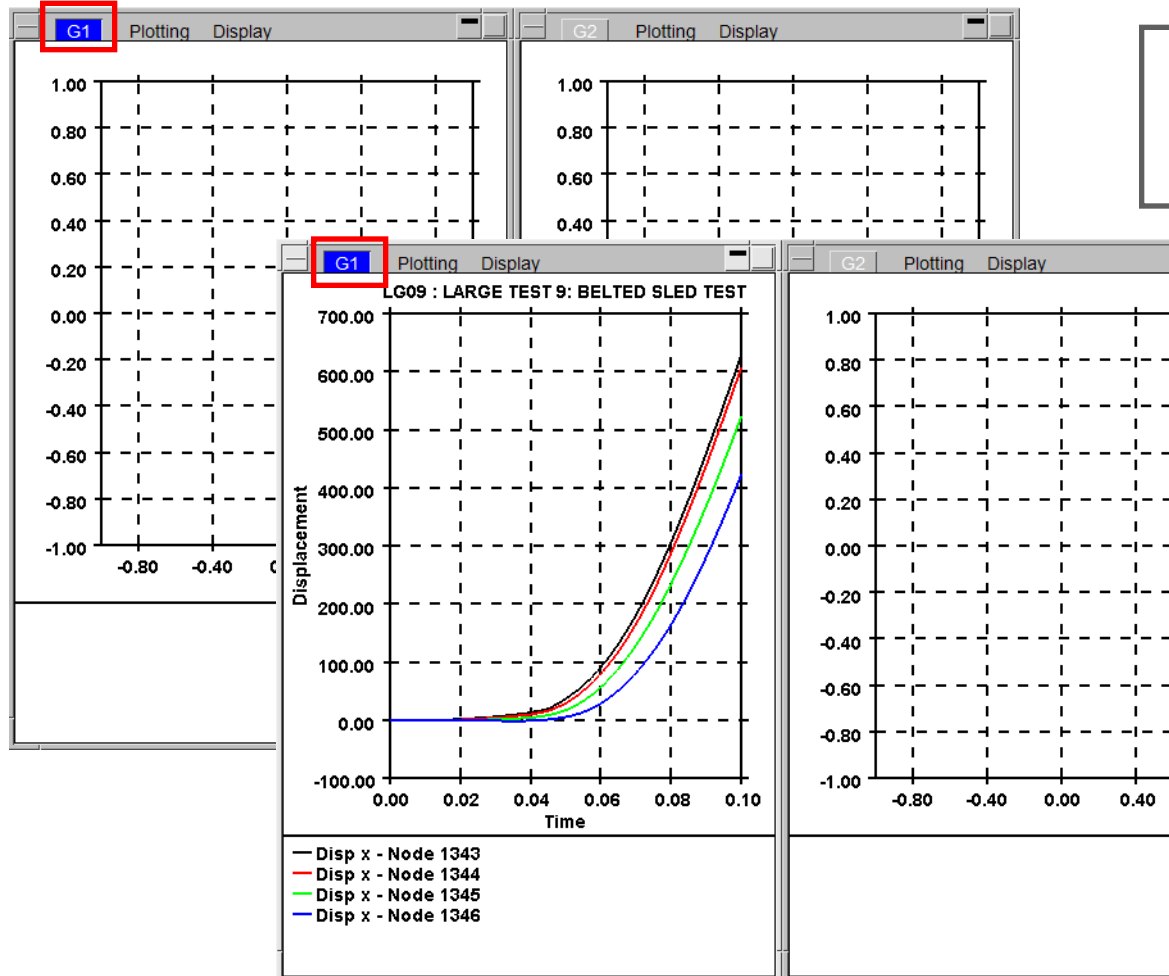
LS-DYNA ENVIRONMENT

ARUP

# Multiple graphs

Oasys

T/HIS



Read Data

LS-DYNA	Groups	Keyword	Curve
Bulk Data	Keyboard	CSV	
Global	Parts	Part Groups	Nodes
Solids	Beams	Shells	Tk Shells
Stonewalls	Springs	Airbags	Contacts
Geo Contacts	Seatbelts	Retractors	Sliprings
Reactions	Joints	X Sections	Subsystems
Rigid Bodies	Spotwelds	SPCs	Boundaries
FSIs	SPHs		
Select Models	New Model	Reread Model	
Output curve: % (highest+1)			
Key in :			
Apply			
Entities			
Sort By Model			
All None			
Select NODE(s)			
M1:Node 1343 :			
M1:Node 1344 :			
M1:Node 1345 :			
M1:Node 1346 :			
M1:Node 1347 :			
M1:Node 1352 :			

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Oasys

LS-DYNA ENVIRONMENT

ARUP

# Multiple graphs

Oasys

T/HIS

Graphs Plotting Functions Display Images Options

Create

Options...

Auto-hide graph tool ba

Use Graphs=>Options  
to change the layout of  
the graphs.

**Graph Layout** ? X

Create

Create Graphs(s)

1 Number of graphs to create

☐ Create using preference settings

☐ Create using current settings

☒ Copy settings from graph 1

Page Size

Width 998 pixels

Height 778 pixels

Automatic Page Layout

☒ Tile Wide

☐ Tile Tall

☐ Cascade

☐ 1 x 1

☐ 2 x 2

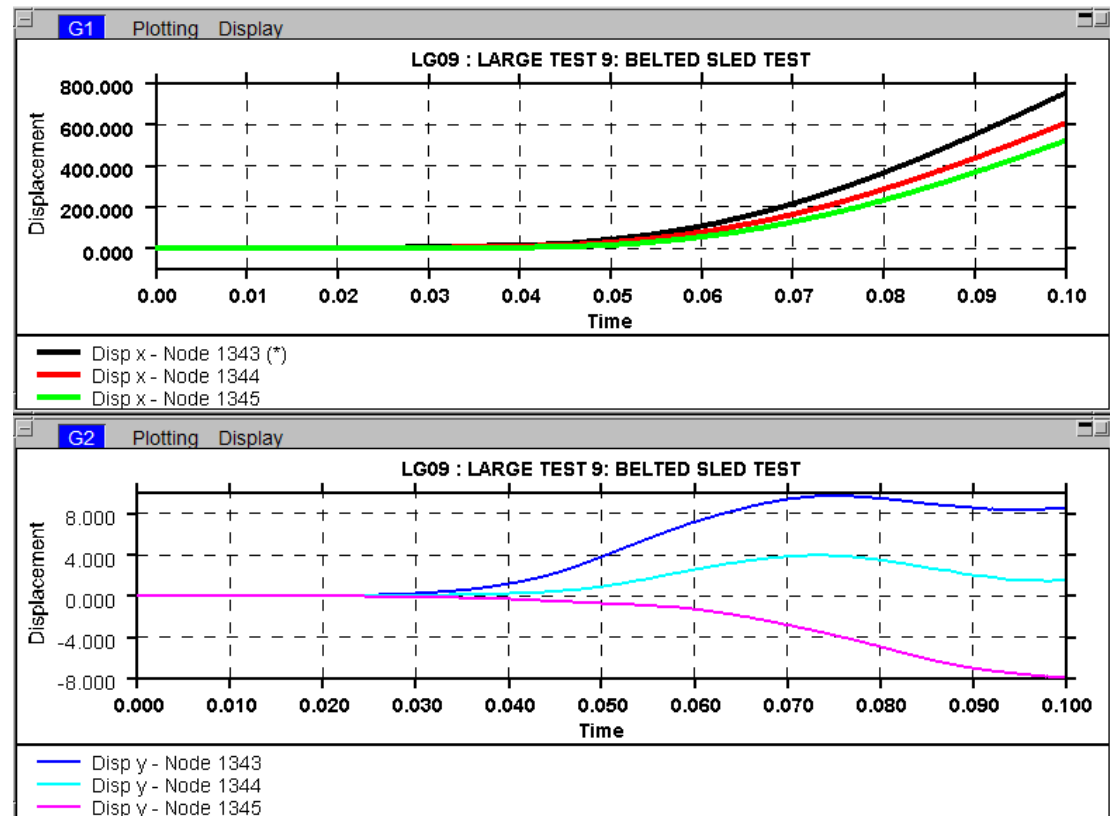
☐ 3 x 3

☐ X x Y

X: 1 Y: 1

Manual Page Layout

Advanced... ☐



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Oasys

LS-DYNA ENVIRONMENT

ARUP



# Multiple graphs

Oasys

T/HIS

Graphs Plotting Functions Display Images Options

Create

Options...

Auto-hide graph tool ba

Graph Layout

Create

Create Graphs(s)

1 Number of graphs to create

☐ Create using preference settings

☐ Create using current settings

☒ Copy settings from graph 1

Page Size

Width 998 pixels

Height 778 pixels

Automatic Page Layout

☐ Tile Wide

☒ Tile Tall

☐ Cascade

☐ 1 x 1

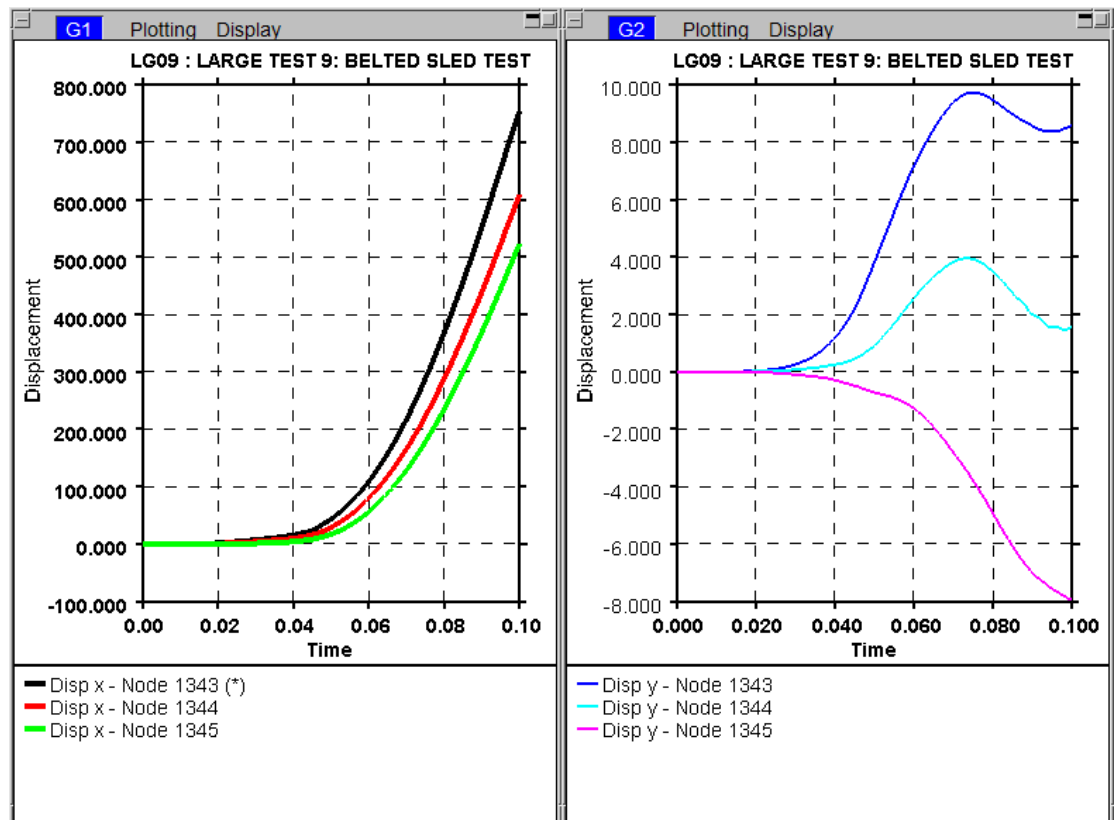
☐ 2 x 2

☐ 3 x 3

☐ X x Y X: 1 Y: 1

Manual Page Layout

Advanced...



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Oasys

LS-DYNA ENVIRONMENT

ARUP

# Multiple graphs

Oasys

T/HIS

Graphs Plotting Functions Display Images Options

Create

Options...

Auto-hide graph tool ba

Graph Layout

Create

Create Graphs(s)

1 Number of graphs to create

☐ Create using preference settings

☐ Create using current settings

☒ Copy settings from graph 1

Page Size

Width 998 pixels

Height 778 pixels

Automatic Page Layout

☐ Tile Wide

☐ Tile Tall

☒ Cascade

☐ 1 x 1

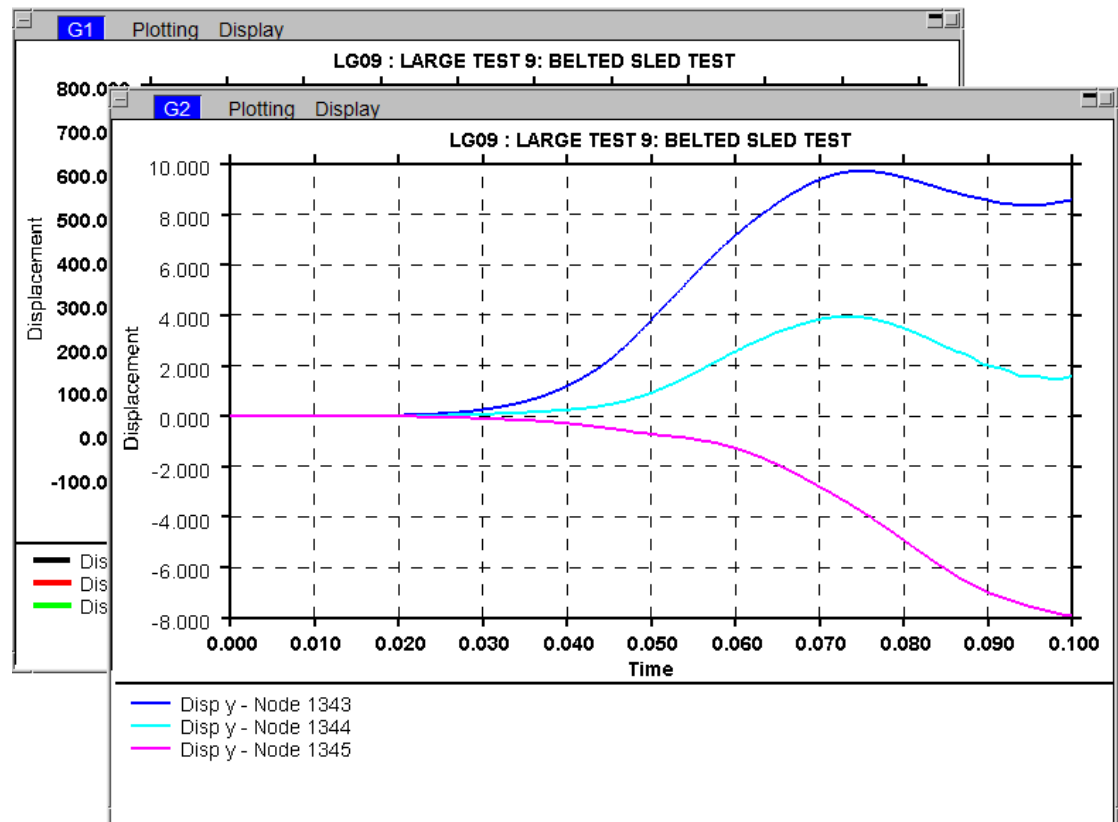
☐ 2 x 2

☐ 3 x 3

☐ X x Y X: 1 Y: 1

Manual Page Layout

Advanced...



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Oasys

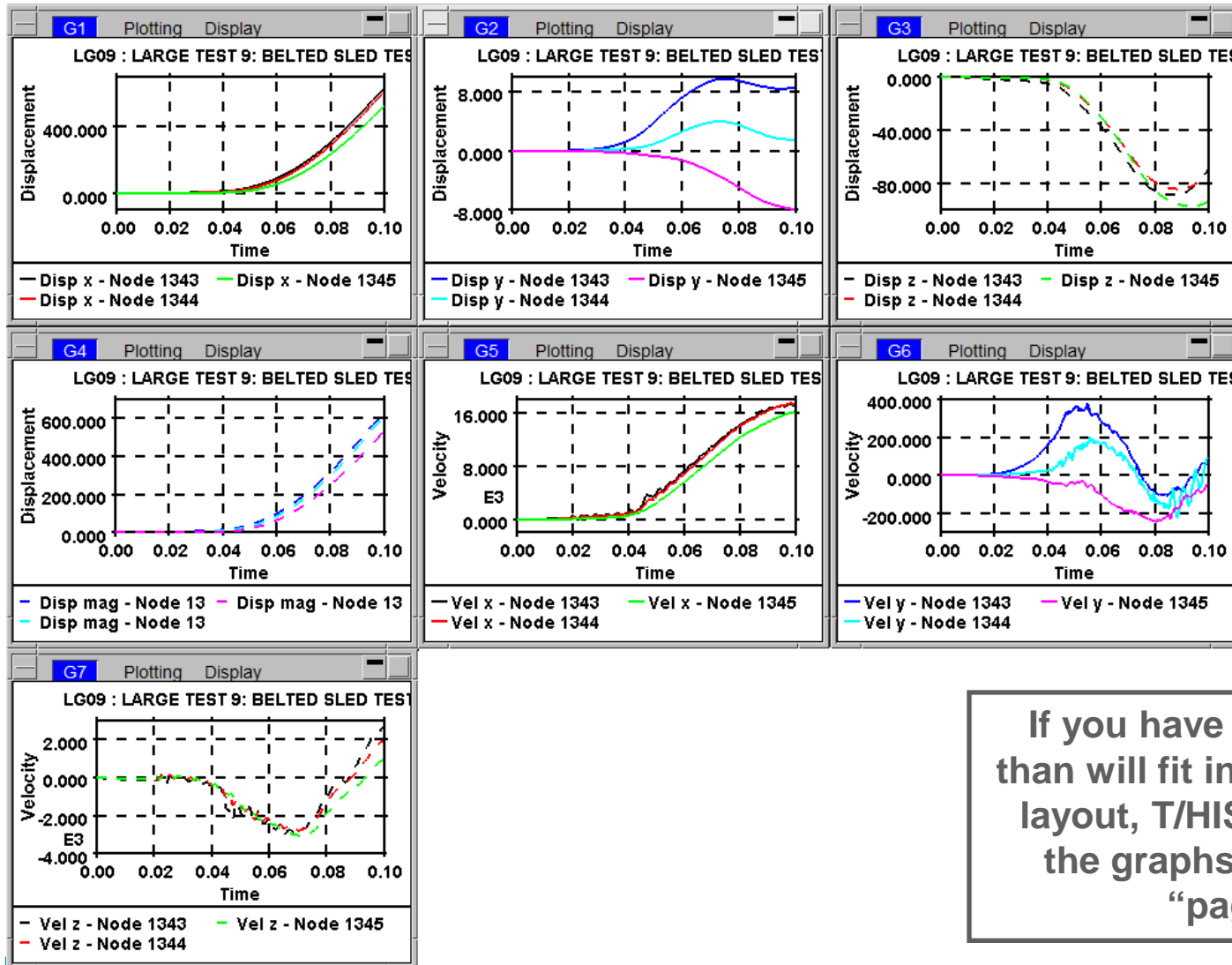
LS-DYNA ENVIRONMENT

ARUP

# Multiple graphs

Oasys

T/HIS



If you have more graphs than will fit in the requested layout, T/HIS can arrange the graphs on multiple “pages”.

# Multiple graphs

Graphs Plotting Functions Display Images Options

Create

Options...

Auto-hide graph tool ba

Graph Layout

Create

Create Graphs(s)

1 Number of graphs to create

☐ Create using preference settings

☐ Create using current settings

☒ Copy settings from graph 1

Page Size

Width 998 pixels

Height 778 pixels

Automatic Page Layout

☐ Tile Wide

☐ Tile Tall

☐ Cascade

☐ 1 x 1

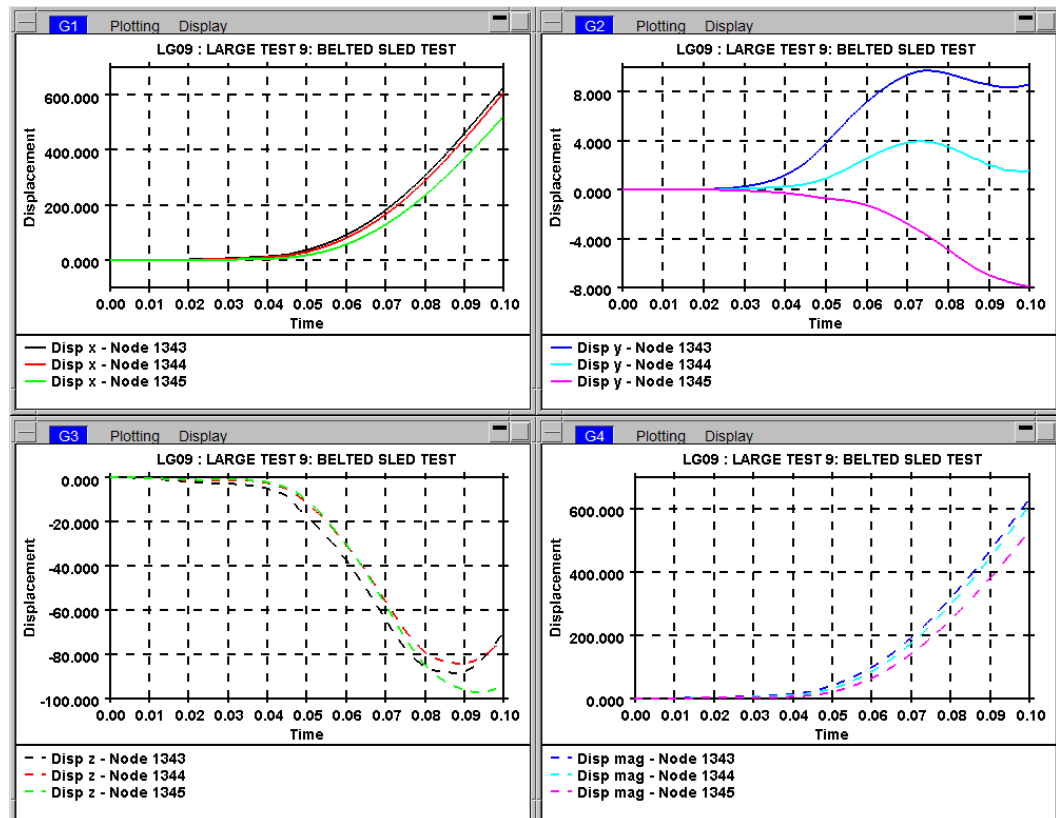
☒ 2 x 2

☐ 3 x 3

☐ X x Y X: 1 Y: 1

Manual Page Layout

Advanced...

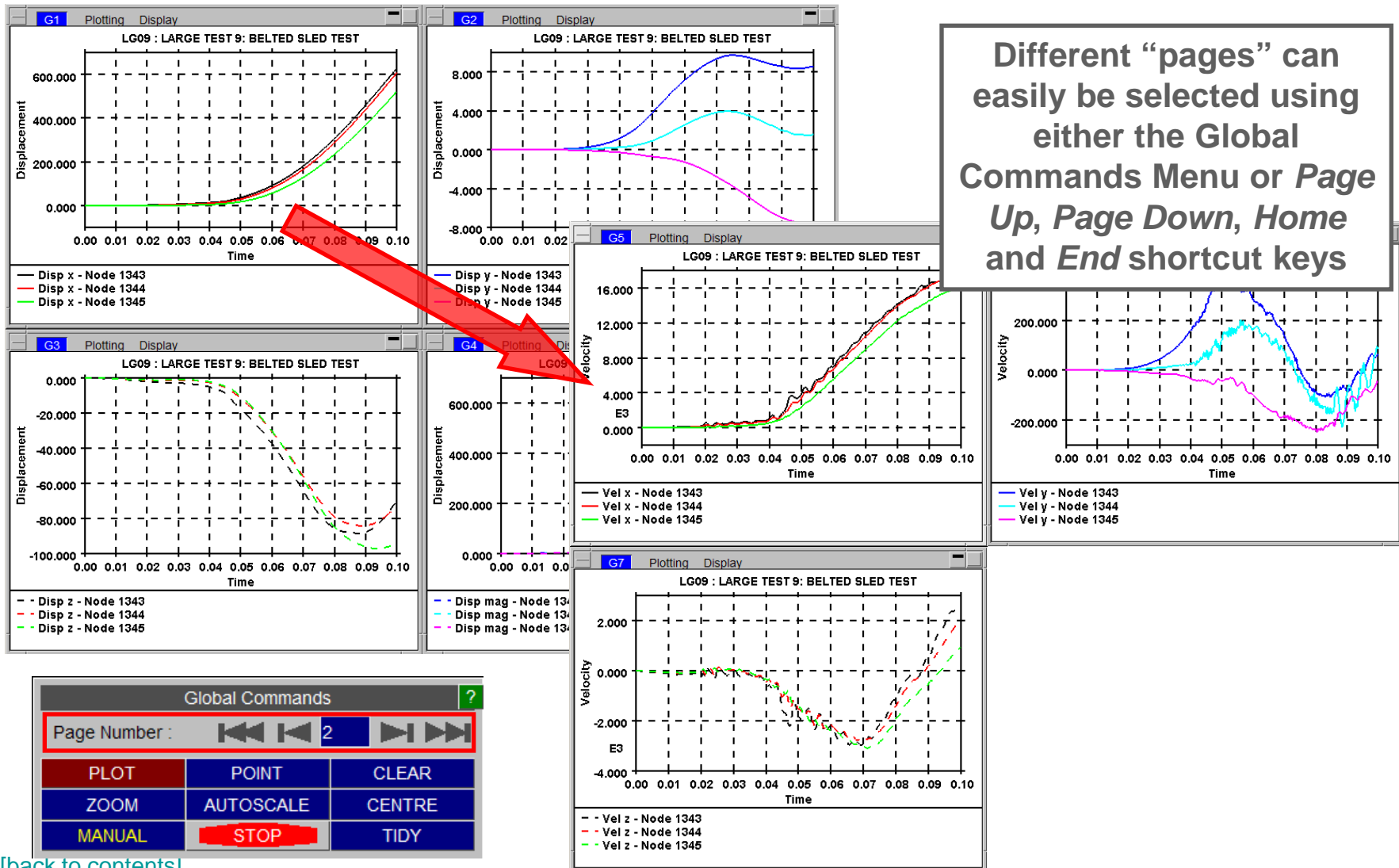


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# Multiple graphs

Oasys

T/HIS



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Oasys

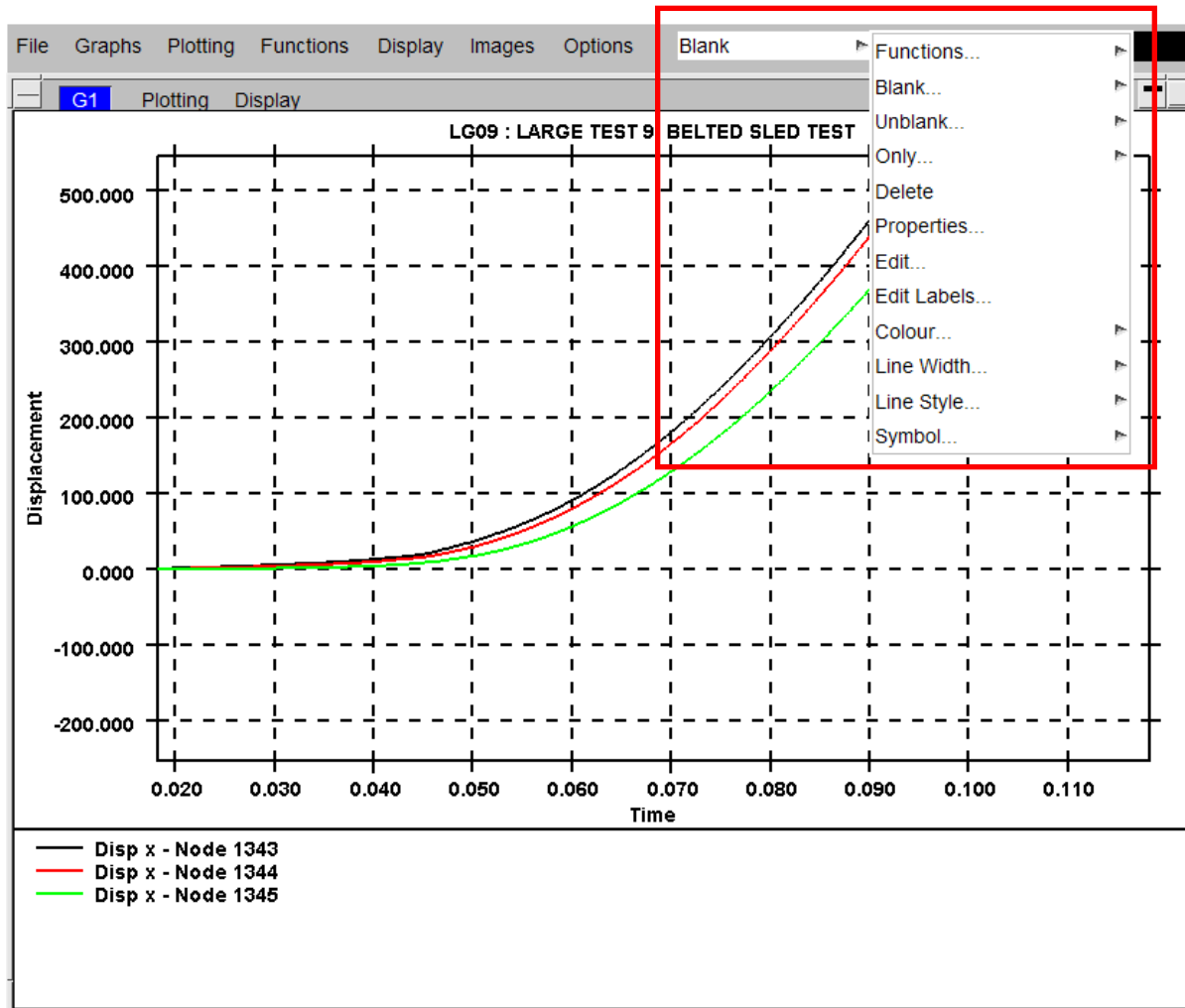
LS-DYNA ENVIRONMENT

ARUP



# Quick-pick

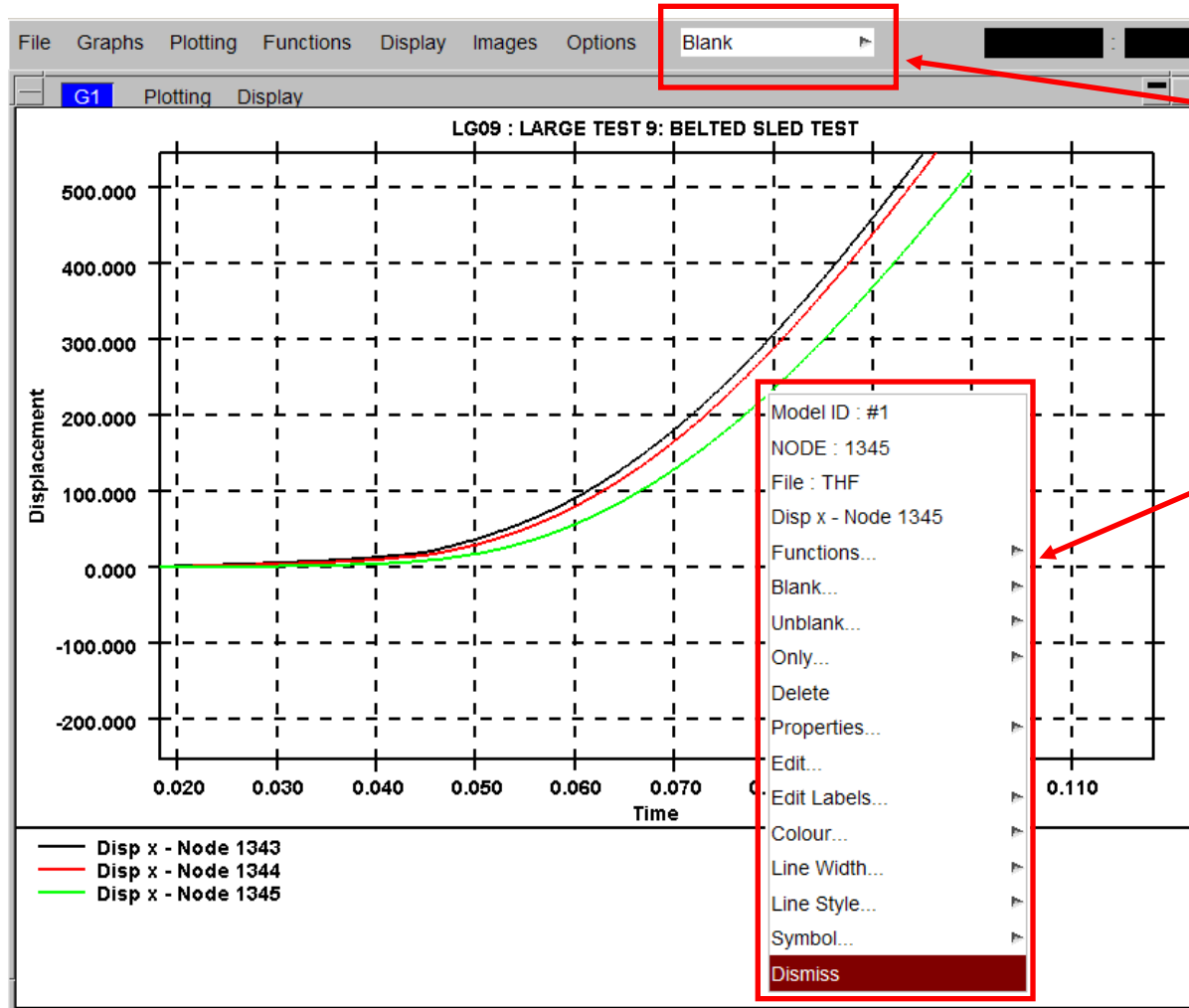
Oasys T/HIS



The Quick-Pick menu can be used to apply functions, edit curves or change the appearance of curves.

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# Quick-pick

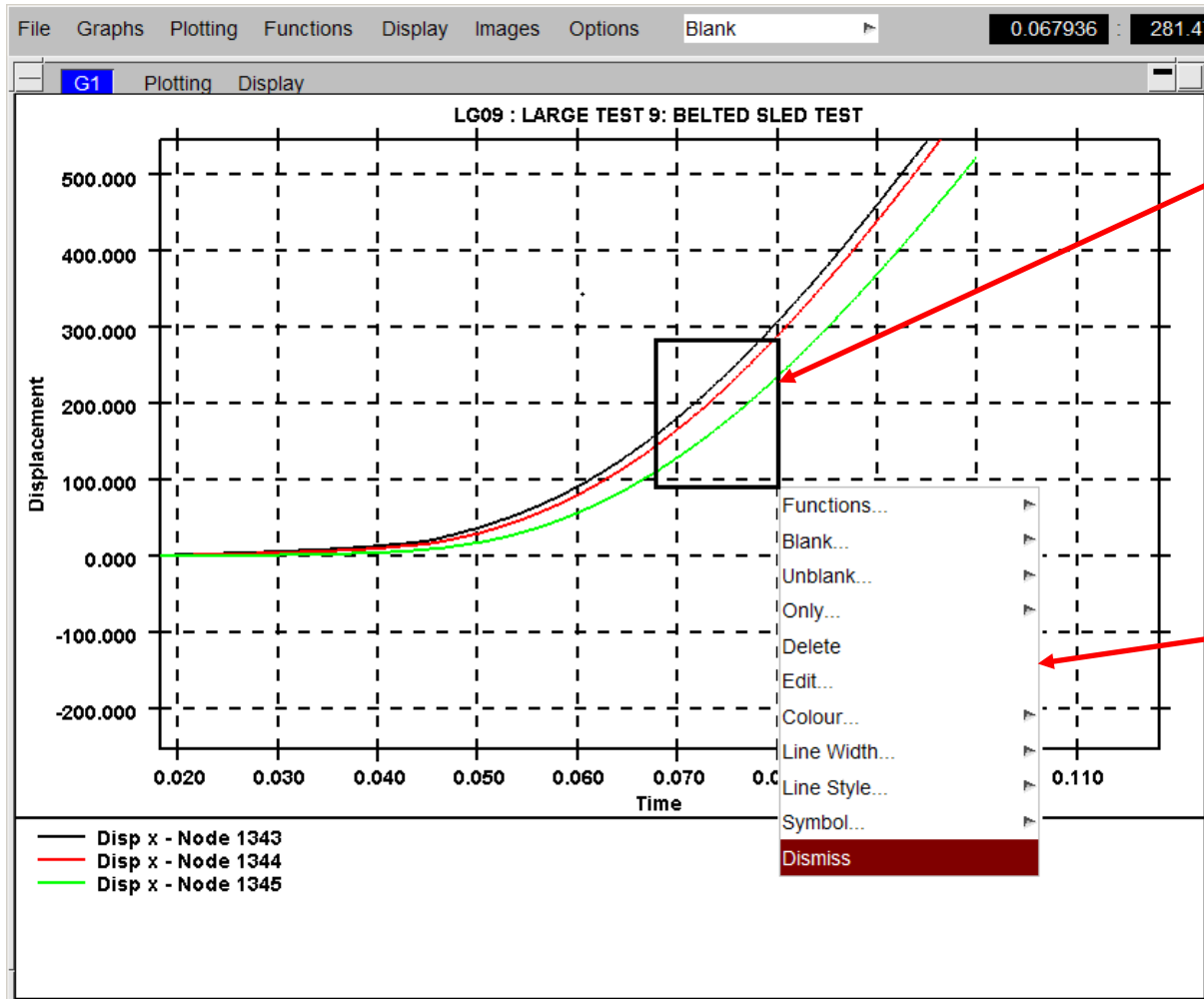


Left-Click on curve to apply current option

Right-Click on a curve to display basic curve information or to apply a different option.

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# Quick-pick - Multiple Curves

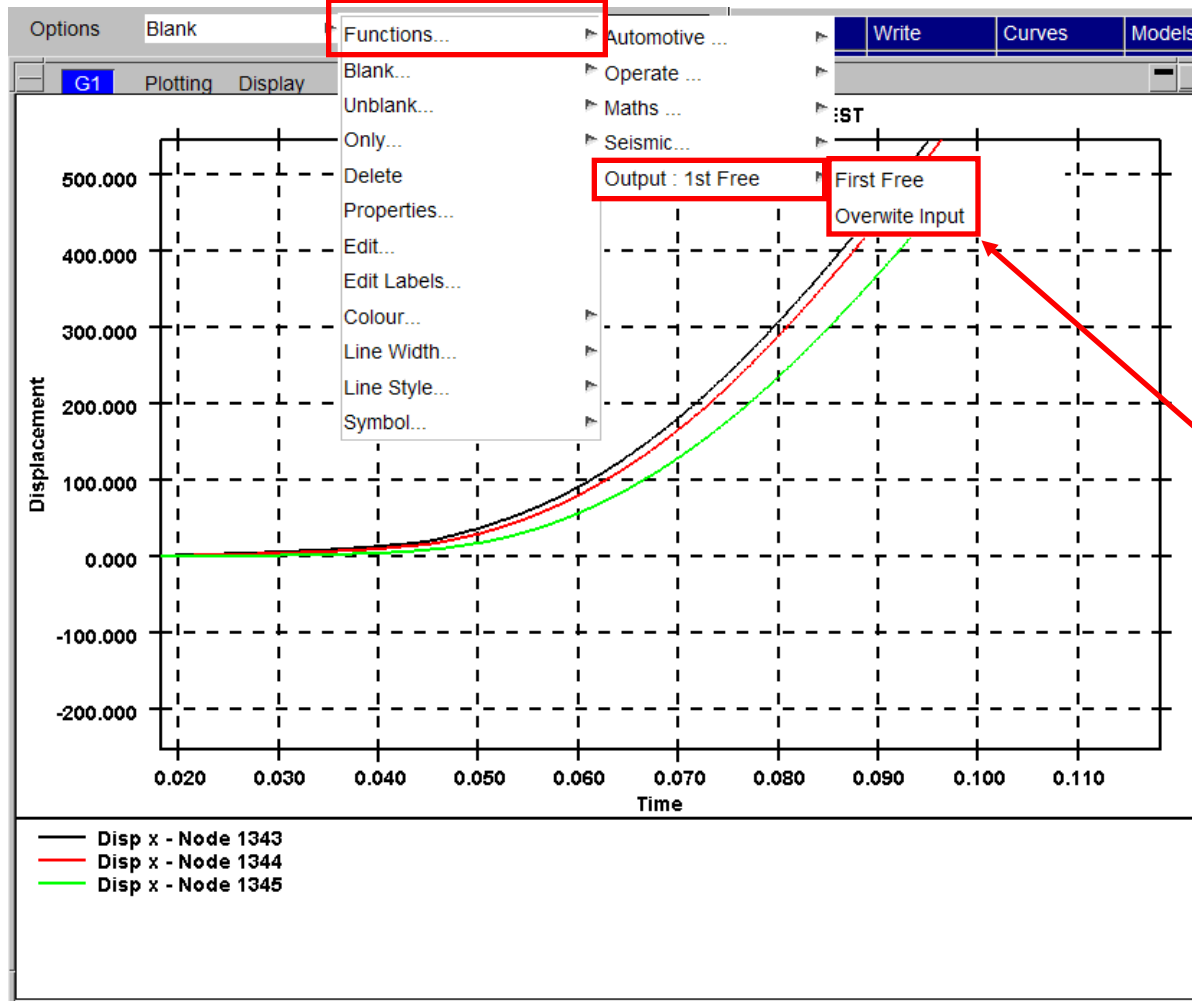


Left-Click and drag to apply the current operation to multiple curves

Right-Click and drag to apply a different option to multiple curves.

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# Quick-pick - Functions



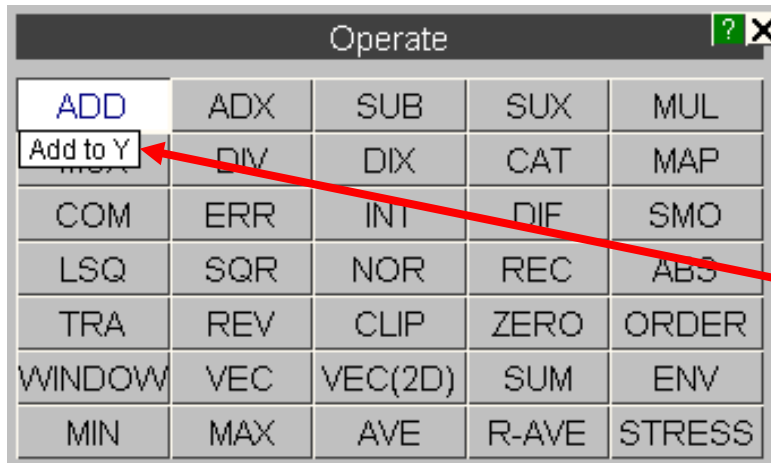
All of the functions available from the Quick-Pick menu generate a single output curve.

The output can be set to either generate a new curve or to overwrite the input curve

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Read	Write	Curves	Models
Edit	Style	Command Fil	Images
Operate	Maths	Automotive	Seismic
Macros	FAST-TCF	Title/Axes	Display
Settings	Preferences	Groups	Graphs

- T/HIS contains over 80 functions for manipulating curve data.
- Functions are divided into 4 main categories: Operate, Maths, Automotive and Seismic.



When a category has been selected you can hover over a button for a longer description



Operate				
ADD	ADX	SUB	SUX	MUL
MUX	DIV	DIX	CAT	MAP
COM	ERR	INT	DIF	SMO
LSQ	SQR	NOR	REC	ABS
TRA	REV	CLIP	ZERO	ORDER
WINDOW	VEC	VEC(2D)	SUM	ENV
MIN	MAX	AVE	R-AVE	STRESS

- The Operate menu contains a number of general functions.
- Basic functions include adding, subtracting, multiplying and dividing curves by either constants or other curves. Other options include integration, differentiation and normalisation.
- More advanced functions include the vector magnitude of 2 or 3 components, summation of multiple curves and the minimum/maximum of multiple curves.

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Automotive				
C60	C180	C600	C1000	BUT
FIR	HIC	HIC(d)	3ms CLIP	EXC
VC	ASI	THIV	NIJ	TTI
NOR	REG	VEC	VEC(2d)	ACU
COR1	COR2			

- The Automotive menu contains a number of filtering options and injury criteria .
  - SAE C60, C180, C600, C1000 filters
  - Butterworth and FIR filters
  - Head Injury Criteria (HIC)
  - 3ms Clip
  - Viscous Criteria
  - Theoretical Head Impact Velocity
  - Neck Injury Criteria
  - Thoracic Trauma Index

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Maths				
SQRT	LOG	EXP	LOG10	** n
LOG(x)	LOG10(x)	SIN	ASIN	COS
ACOS	TAN	ATAN		

- The Maths menu contains a number of standard mathematical functions .
  - Square Root, Ln, Exponential, Log
  - SIN, COS, TAN, ASIN, ACOS, ATAN

Seismic				
DV	DA	VD	VA	AD
AV	DS	RS	FFT	NCP
BLC				

- The Seismic menu can be used to handle response spectra information. In particular, displacement, velocity or acceleration spectra can be read and converted to another format.

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# Curve Operations

Operate

ADD	ADX	SUB	SUX	MUL
MUX	DIV	DIX	CAT	MAP
COM	ERR	INT	DIF	SMO
LSQ	SQR	NOR	REC	ABS
TRA	REV	CLIP	ZERO	ORDER
WINDOW	VEC	Clip: limit X and Y	ENV	
MIN	MAX	AVE	R-AVE	STRESS

☒ Copy Style from Input to Output Curve

X minimum value: -0.10000E+21  
X maximum value: 0.10000E+21  
Y minimum value: -0.10000E+21  
Y maximum value: 0.10000E+21

Apply Output: # (first free)

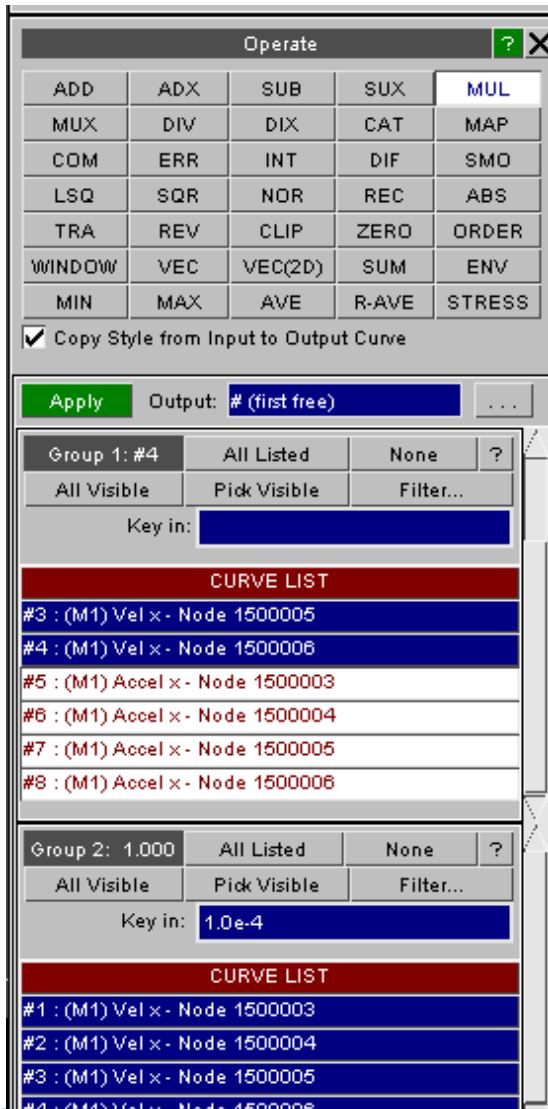
Group 1: #0 All Listed None ?  
All Visible Pick Visible Filter...  
Key in:

**CURVE LIST**

#1 : (M1) Vel x - Node 1500003
#2 : (M1) Vel x - Node 1500004
#3 : (M1) Vel x - Node 1500005
#4 : (M1) Vel x - Node 1500006
#5 : (M1) Accel x - Node 1500003
#6 : (M1) Accel x - Node 1500004
#7 : (M1) Accel x - Node 1500005
#8 : (M1) Accel x - Node 1500006

- Operations requiring one curve input,
- e.g. clip(A) => B.
- A ("Group 1") can be one or many curves. Click on the curves in the list, or use Pick Visible then Done to terminate picking.
- If the operation requires constants, these are typed in the text boxes.
- One output curve is produced from each input curve.

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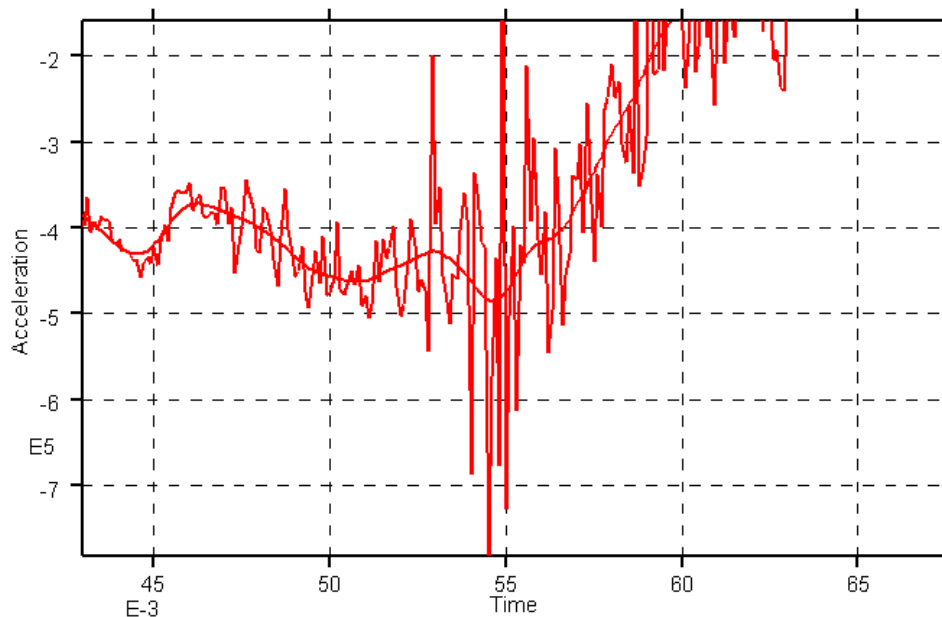
- Operations requiring two inputs,
- e.g. Multiply  $A \times B = C$
- A ("Group 1") can be one or many curves. Click on the curves in the list or use Pick Visible (and press Done to terminate picking). Say Group 1 contains  $N$  curves.
- B ("Group 2") can be
  - Constant: key in the value. Each curve in Group 1 will be multiplied by the constant, producing  $N$  output curves.
  - One curve. Each curve in Group 1 will be multiplied by this curve (the y-values at each x-point are multiplied together), producing  $N$  output curves.
  - $N$  curves. The first curve in A is multiplied by the first curve in B, the second by the second, etc, resulting in  $N$  output curves.

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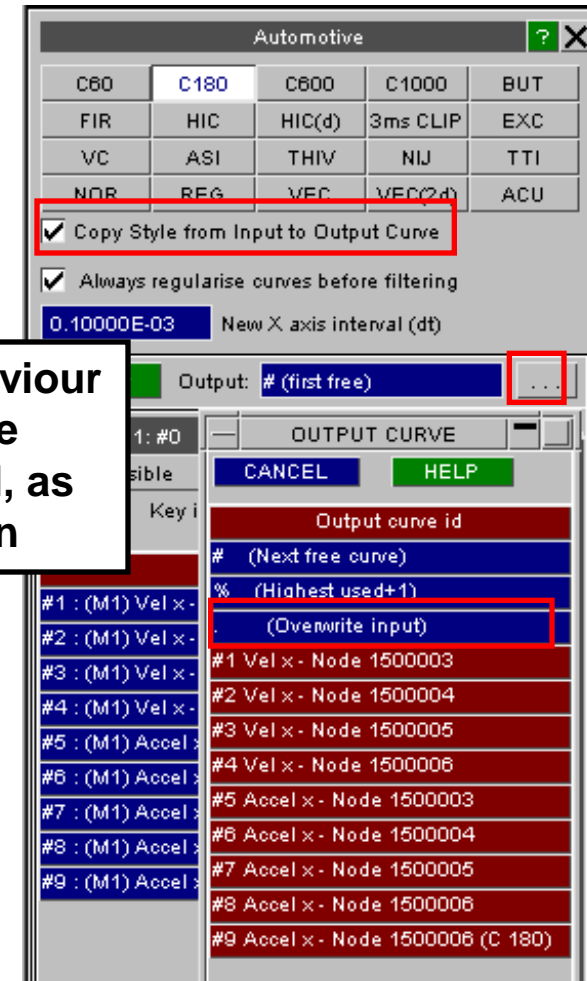
# Curve Operations

- By default, both input and output curves are kept; the output curve has the same colour and style as the input curve. Example shown here after C180 filter.



— Accel x - Node 1500006  
— Accel x - Node 1500006 (C 180)

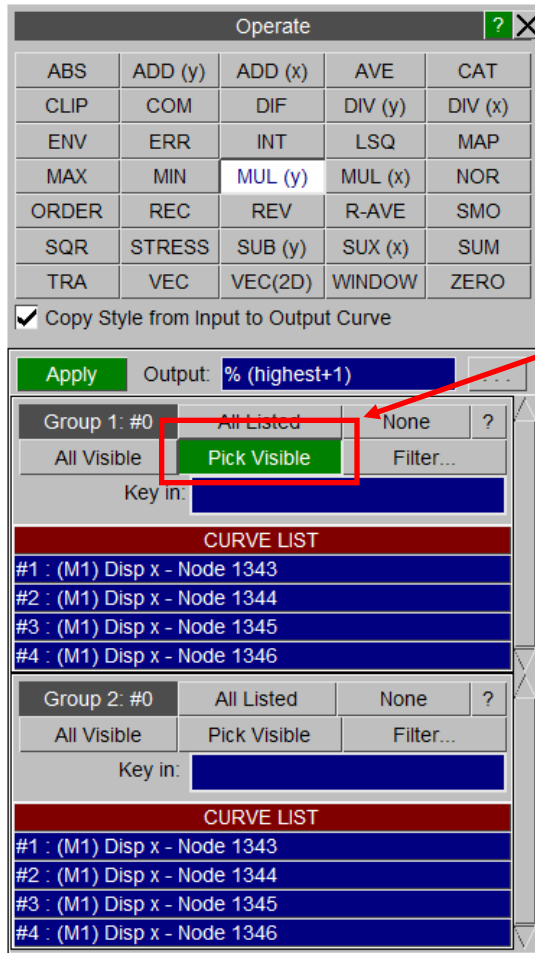
This behaviour  
can be  
changed, as  
shown



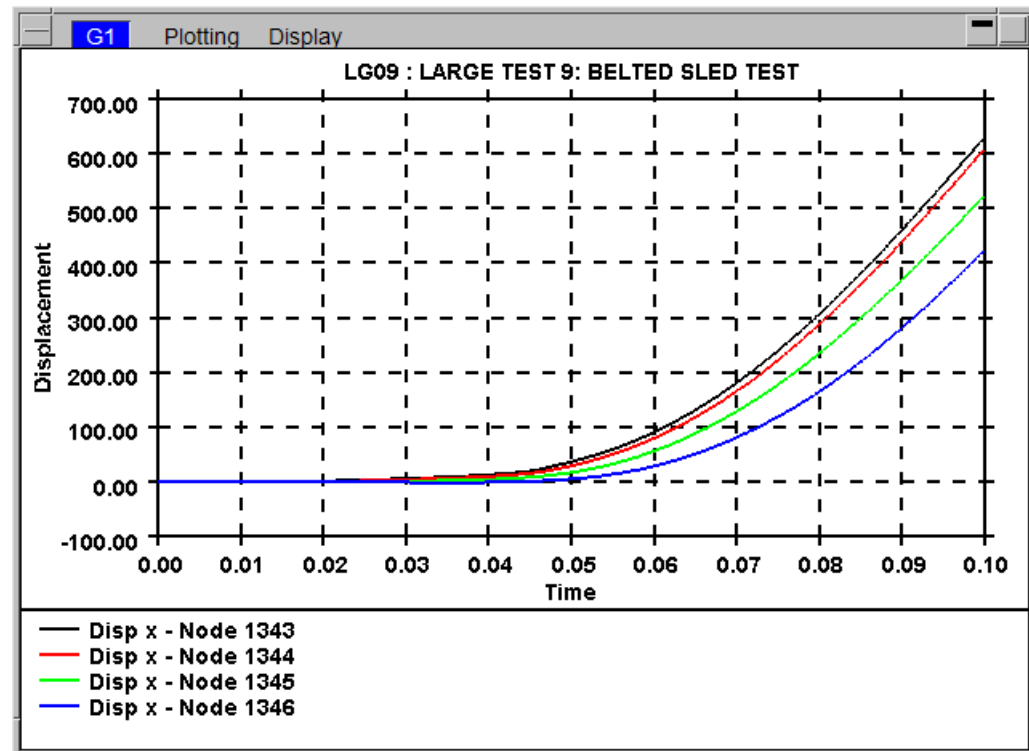
Oasys T/HIS

Version 9.2  
10-FEB-06

# Curve Operations – Selecting Curves



Curve Picking is automatically activated to select input curves for functions

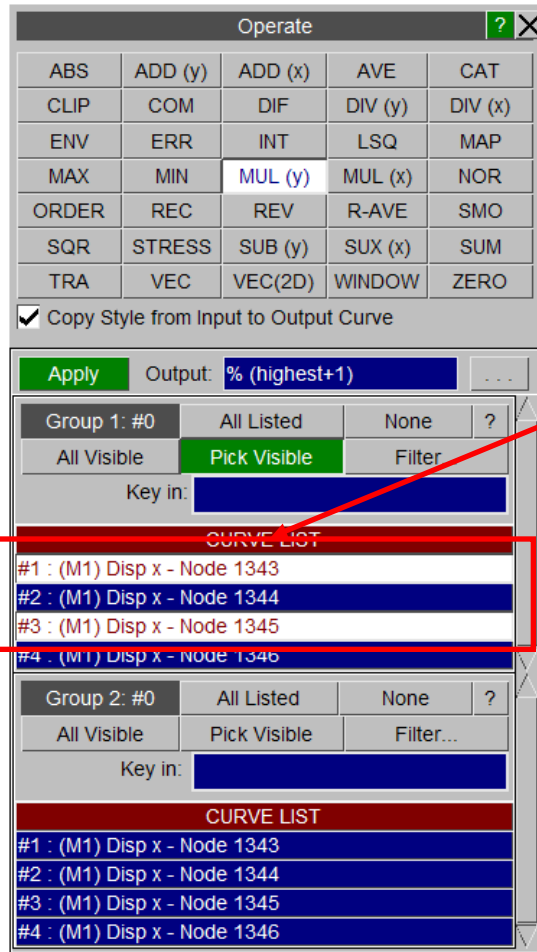


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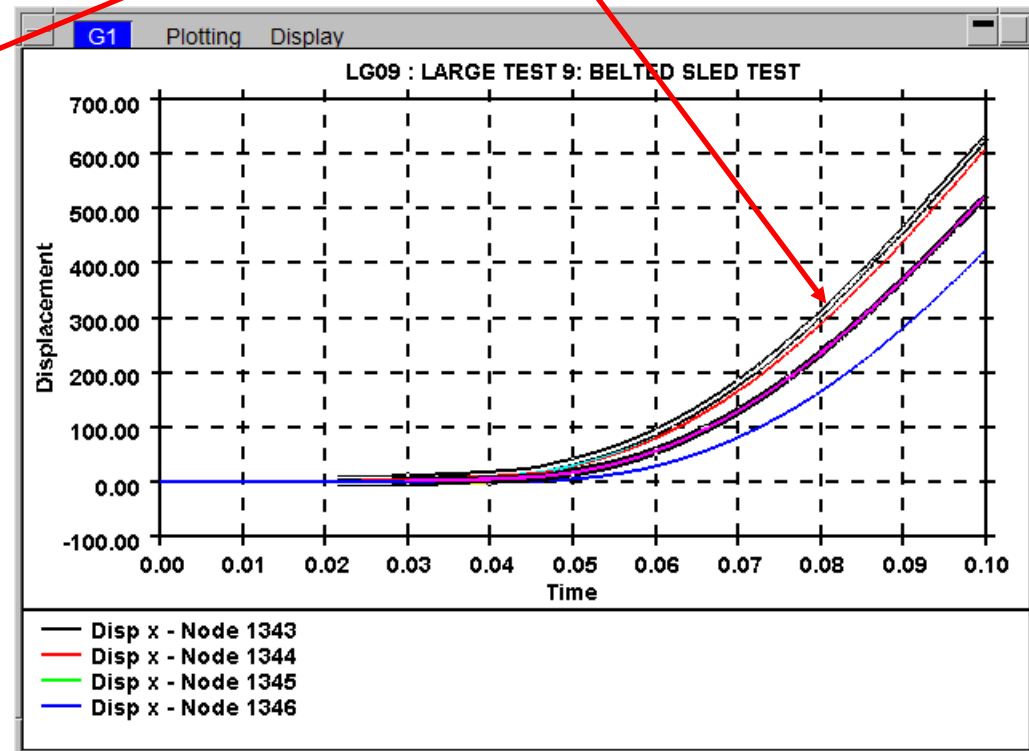
# Curve Operations – Selecting Curves

Oasys

T/HIS



Curves are highlighted as they are picked



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Oasys

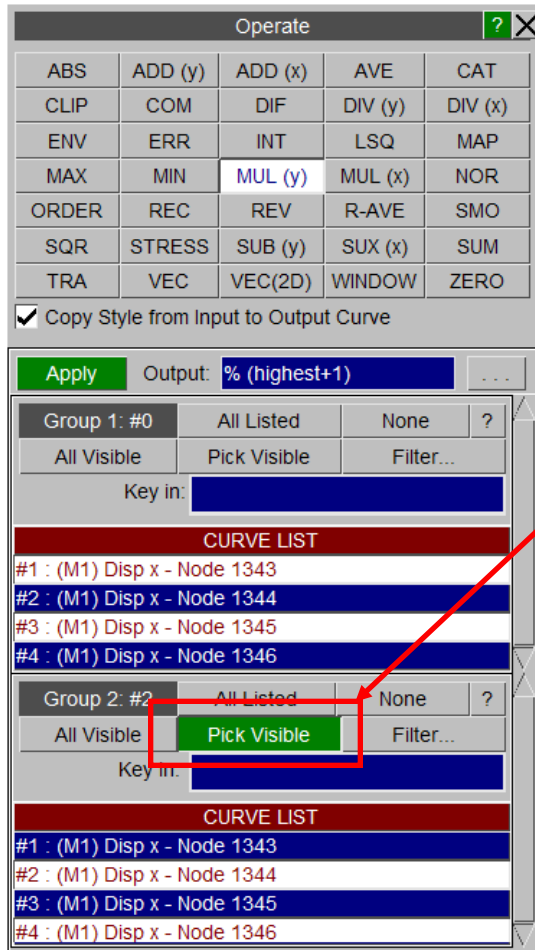
LS-DYNA ENVIRONMENT

ARUP

# Curve Operations – Selecting Curves

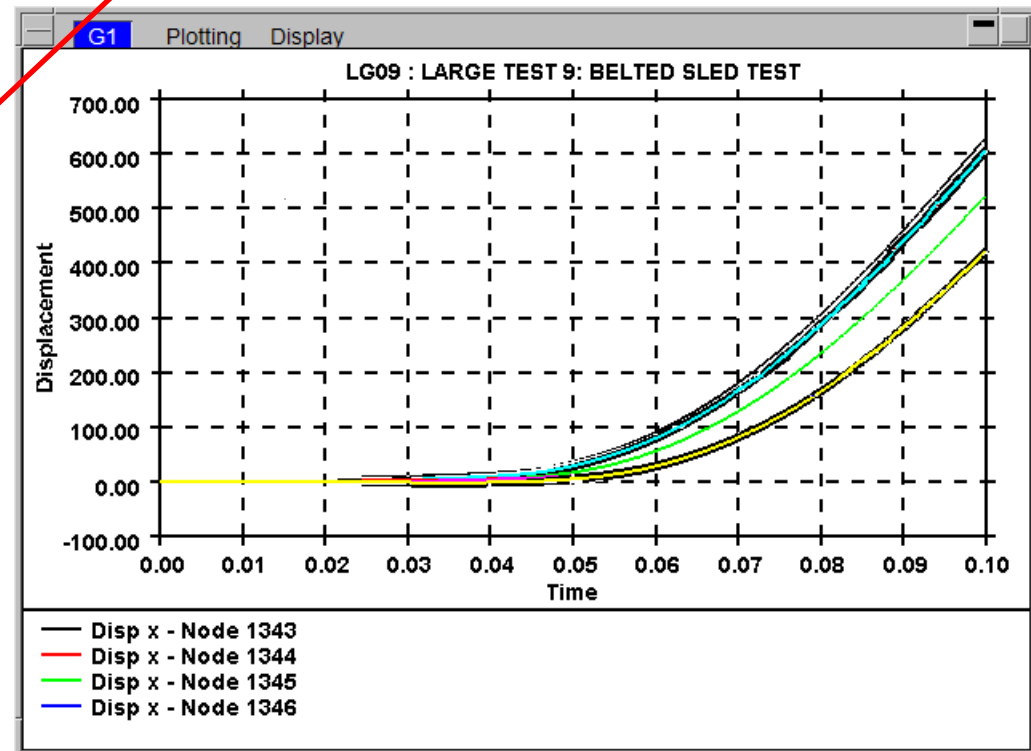
Oasys

T/HIS



Shortcut key “V” toggles between curve picking groups.

“Q” swaps back to “Quick-pick”



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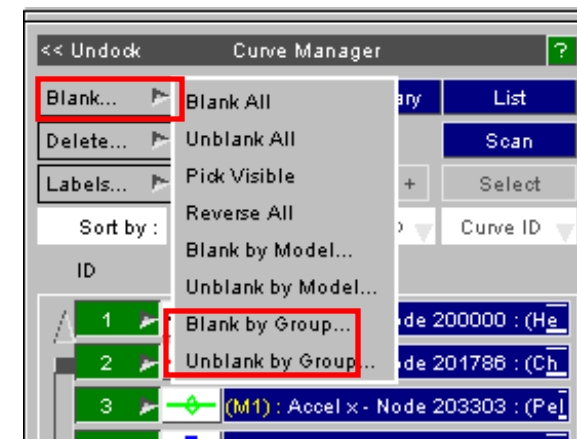
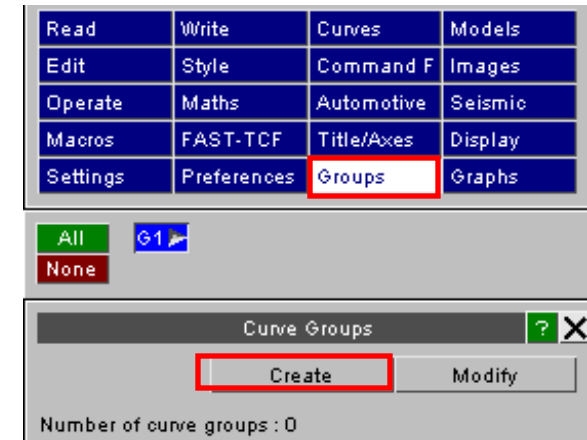
Oasys

LS-DYNA ENVIRONMENT

ARUP

# Curve Operations – Curve Groups

- Groups of curves used to apply the same style, operations or blanking to multiple curves.
- Use Tools=>Groups=>Create to create groups.
- From Curves menu, right-click on Blank to Blank (or Unblank) by groups.



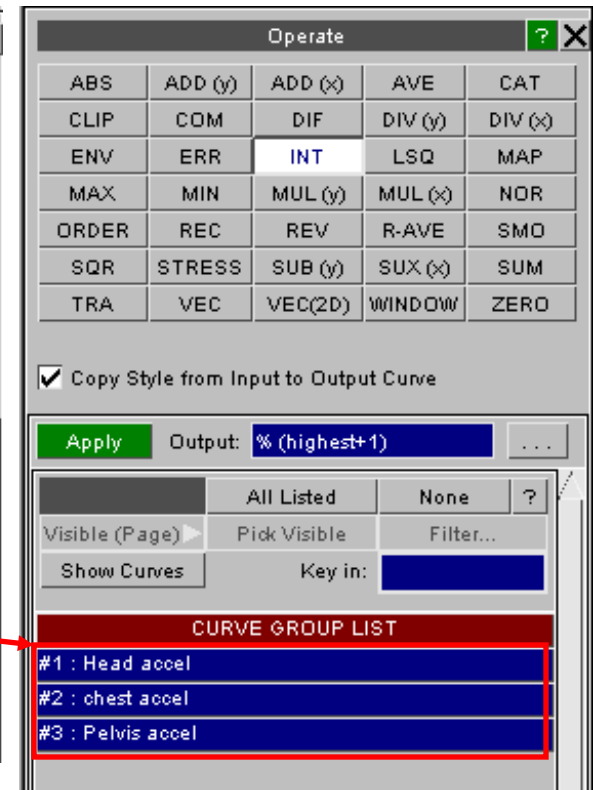
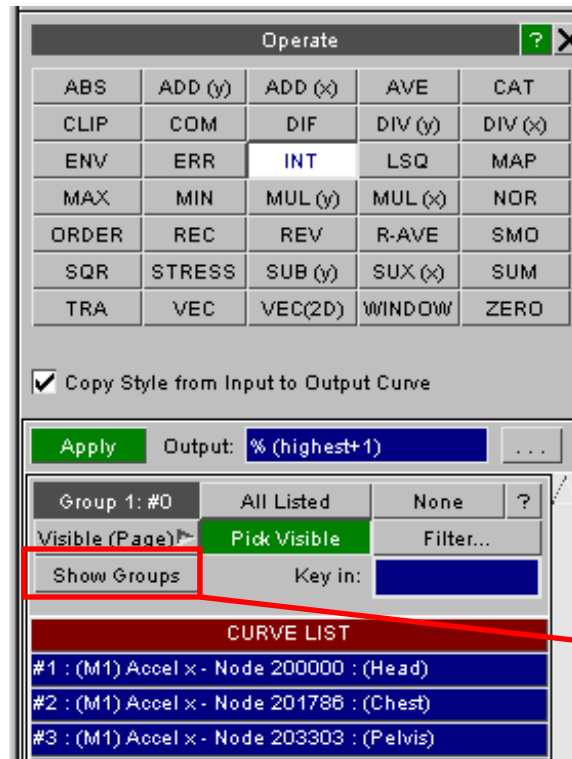
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# Curve Operations – Curve Groups



- In menus in which curves are selected (Operate, Style, Write, etc), toggle between selection by curves or by groups.
- Clicking on a group selects all the curves in that group.
- Groups are saved in FAST-TCF scripts.

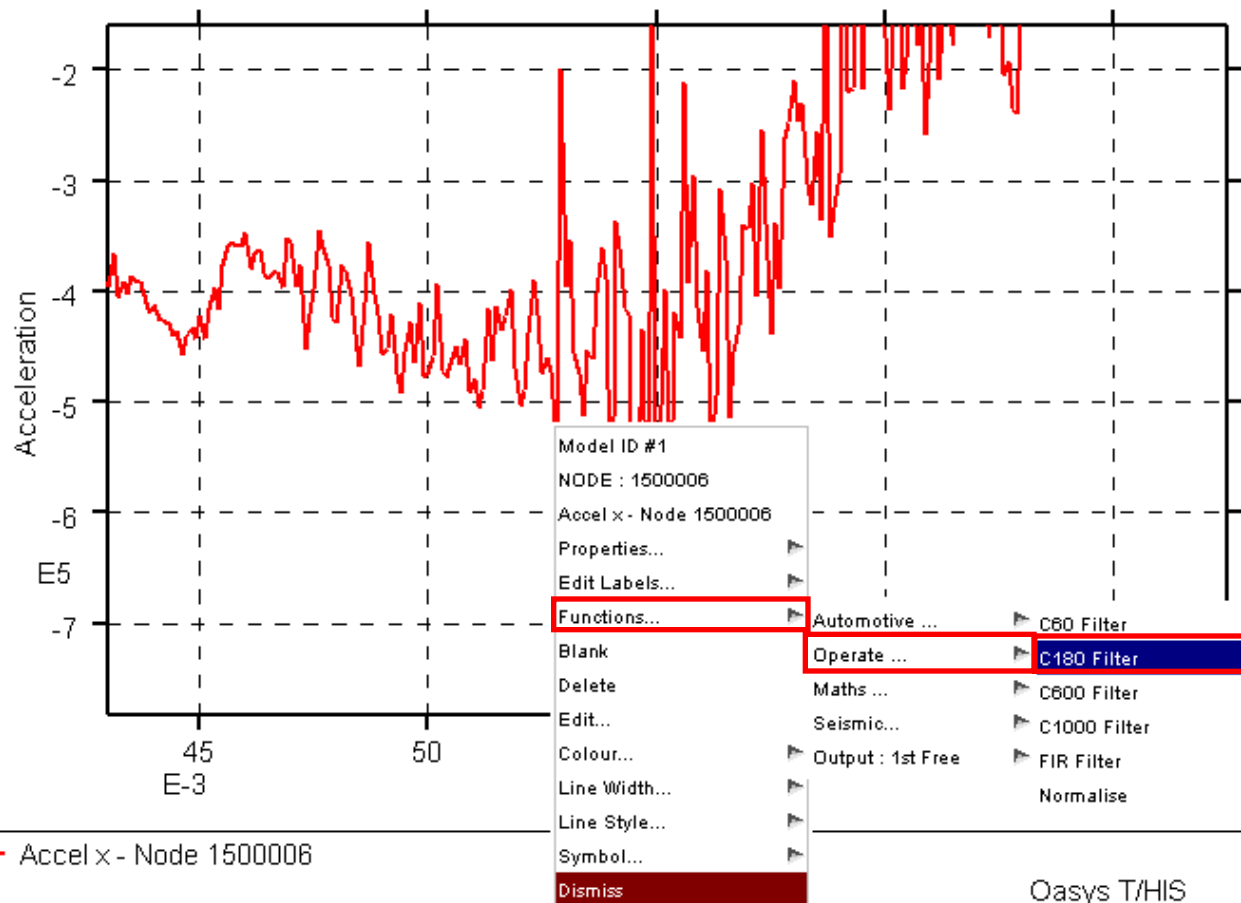


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# Curve Operations – Using Quick-Pick

Oasys

T/HIS



**Operations that require only one input and no constants may be performed by right-clicking the curve.**

Oasys T/HIS

Version 9.2  
10-FEB-06

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Oasys

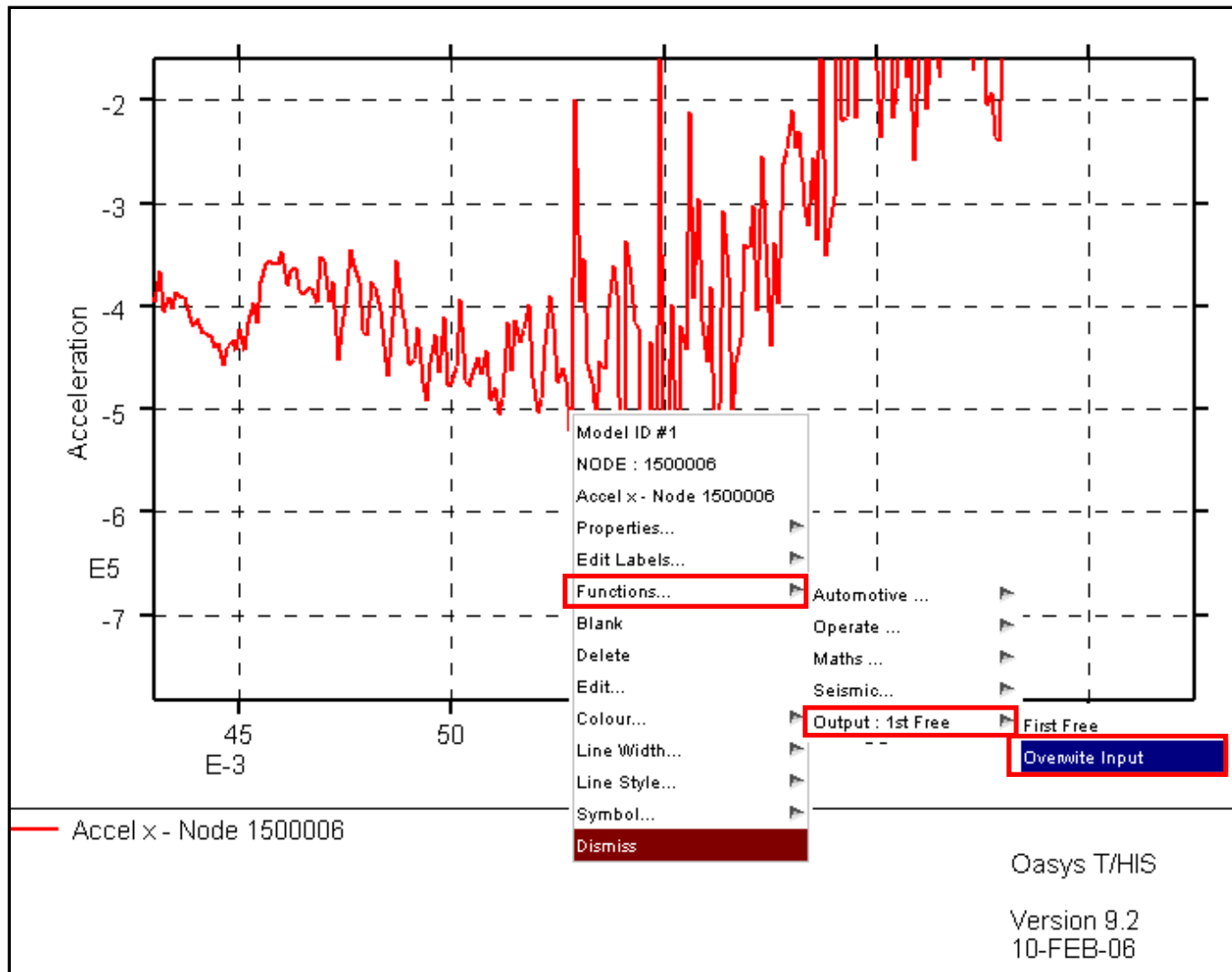
LS-DYNA ENVIRONMENT

ARUP

# Curve Operations – Using Quick-Pick

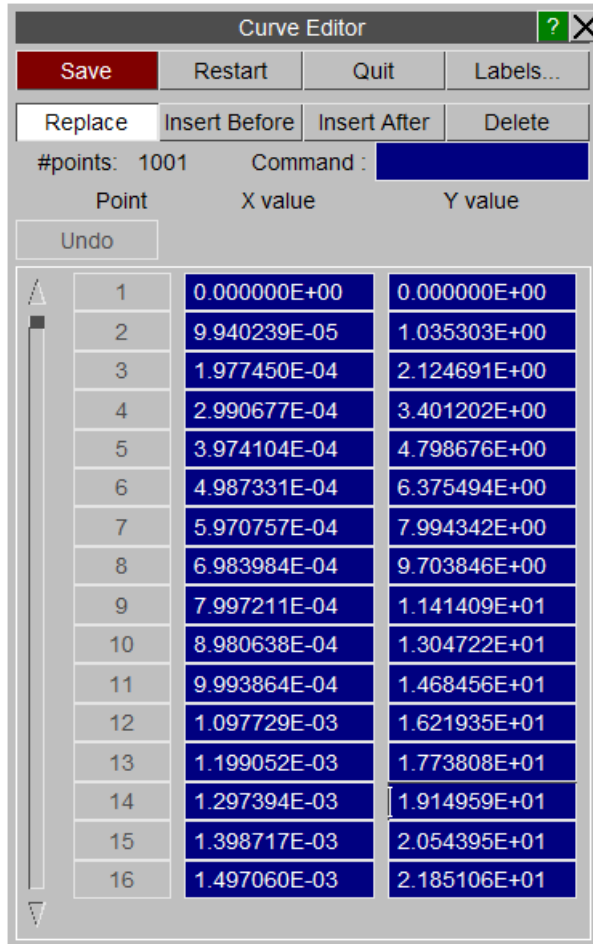
Oasys

T/HIS

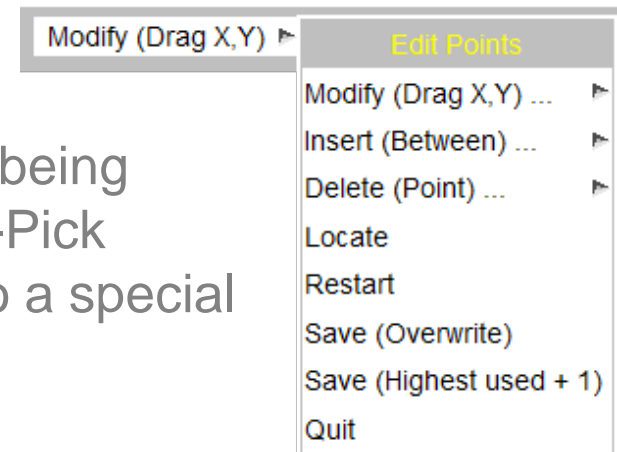


The “overwrite input” setting is also available from here, so the original curve will automatically disappear.

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- In addition to the standard edit menu curves can be edited interactively.

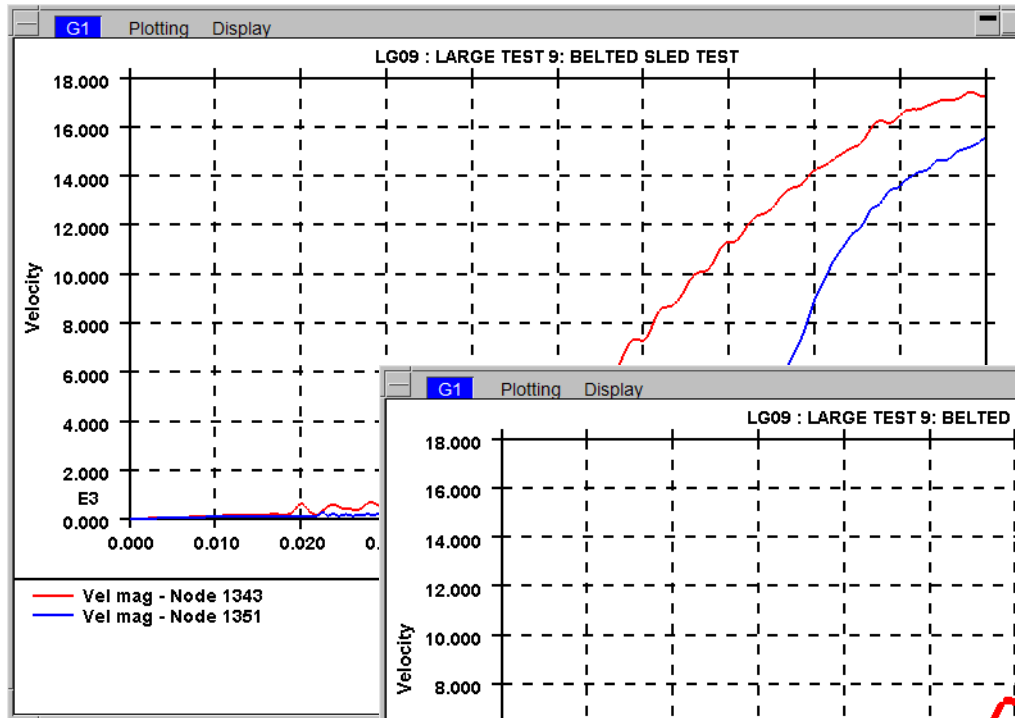


- When a curve is being edited the Quick-Pick menu changes to a special 'EDIT' mode.

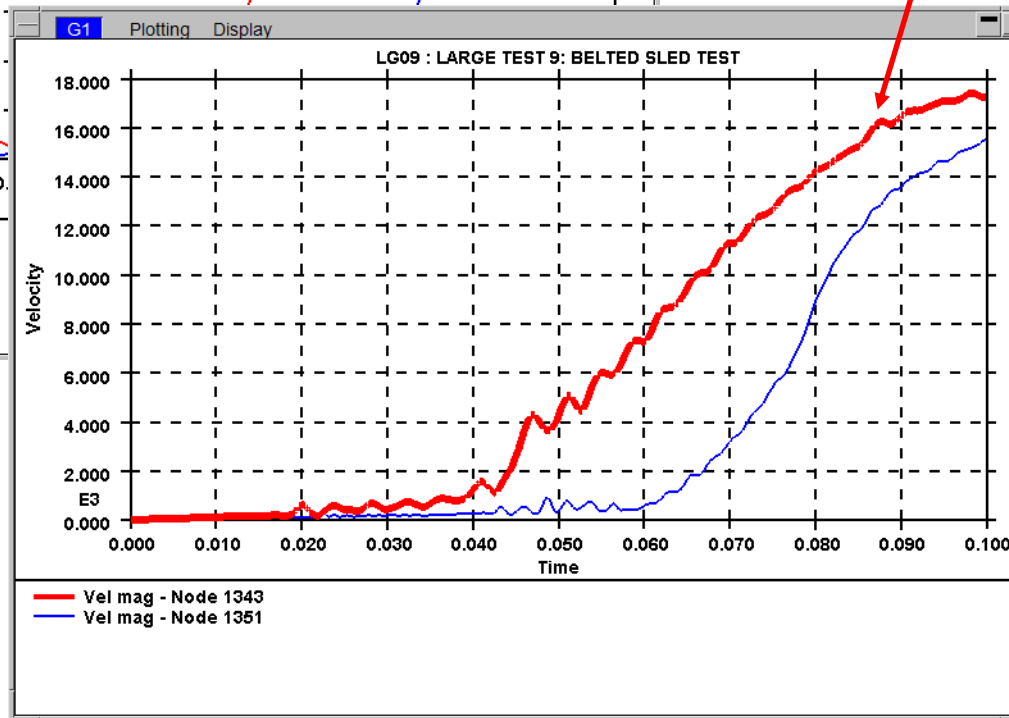
# Curve editing

Oasys

T/HIS



In curve being edited is highlighted and drawn in the normal graph window.



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Oasys

LS-DYNA ENVIRONMENT

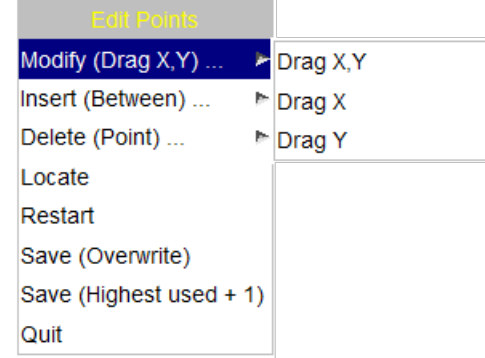
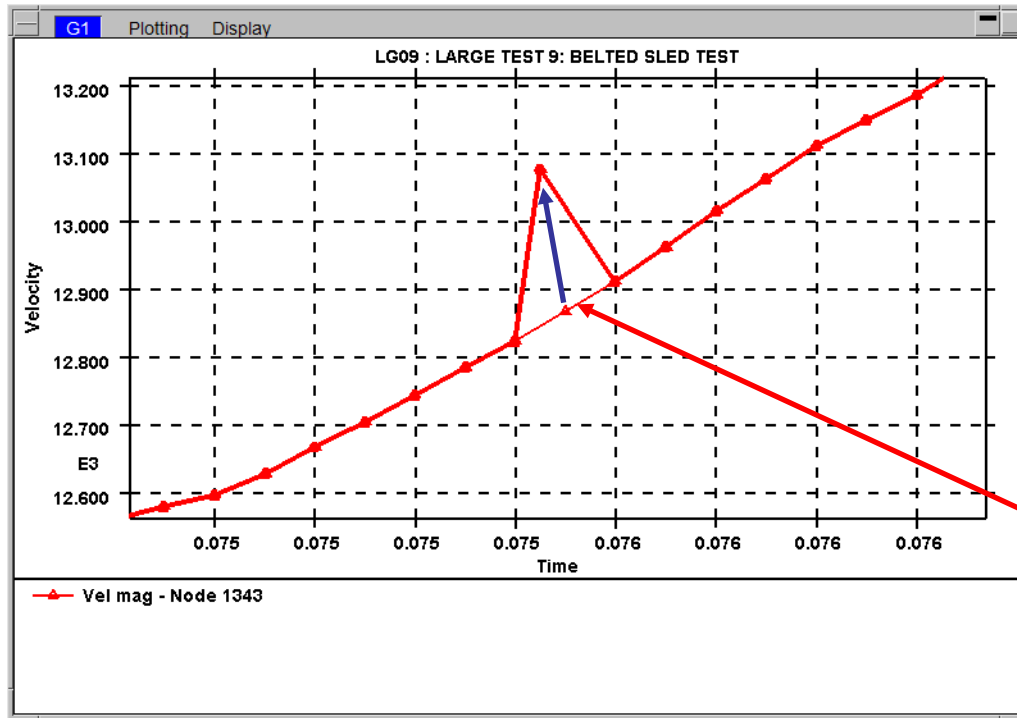
ARUP



# Curve editing – Modify Point

Oasys

T/HIS



Existing points can be selected and dragged in X, Y or both.

Both the original and the modified curves are drawn.

As a point is dragged it's coordinates are updated automatically.

756 7.549960E-02 1.286844E+04

756 7.533895E-02 1.313067E+04

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Oasys

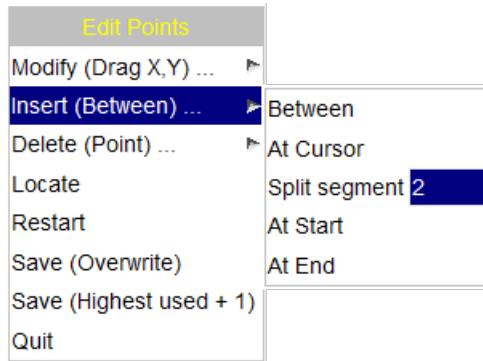
LS-DYNA ENVIRONMENT

ARUP

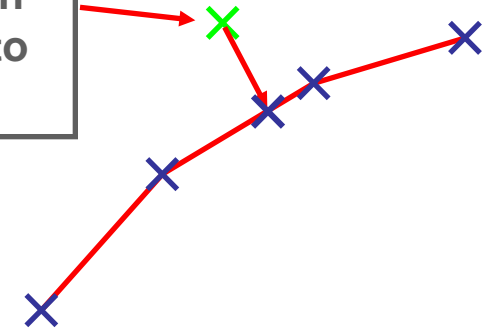
# Curve editing – Insert Point

Oasys

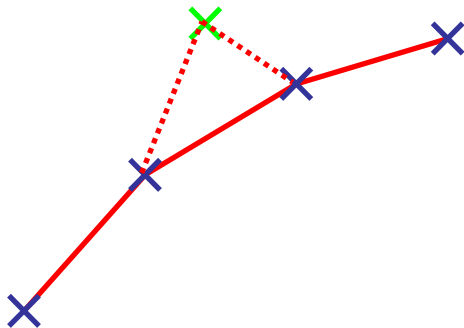
T/HIS



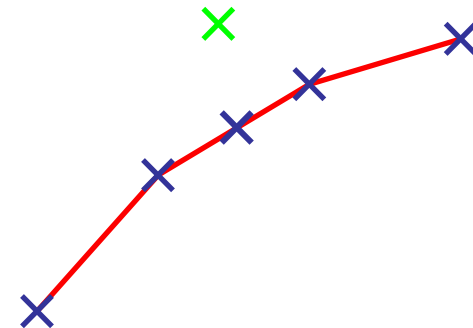
**Between** – Picked screen location is projected onto nearest segment



**At Cursor** – New Point created at screen location



**Split Segment** – Nearest segment is split in “n” parts



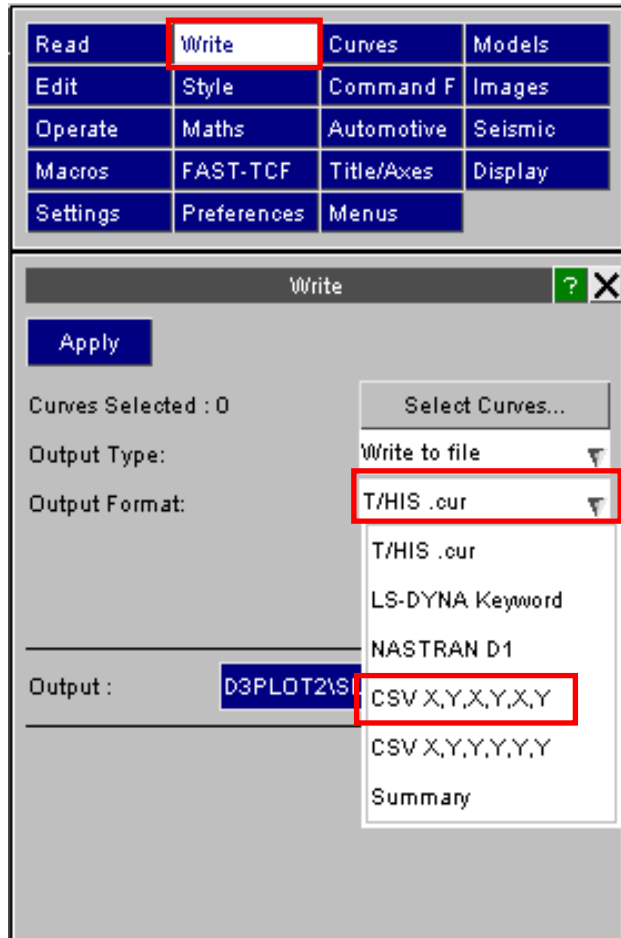
[\[back to contents\]](#)

Oasys

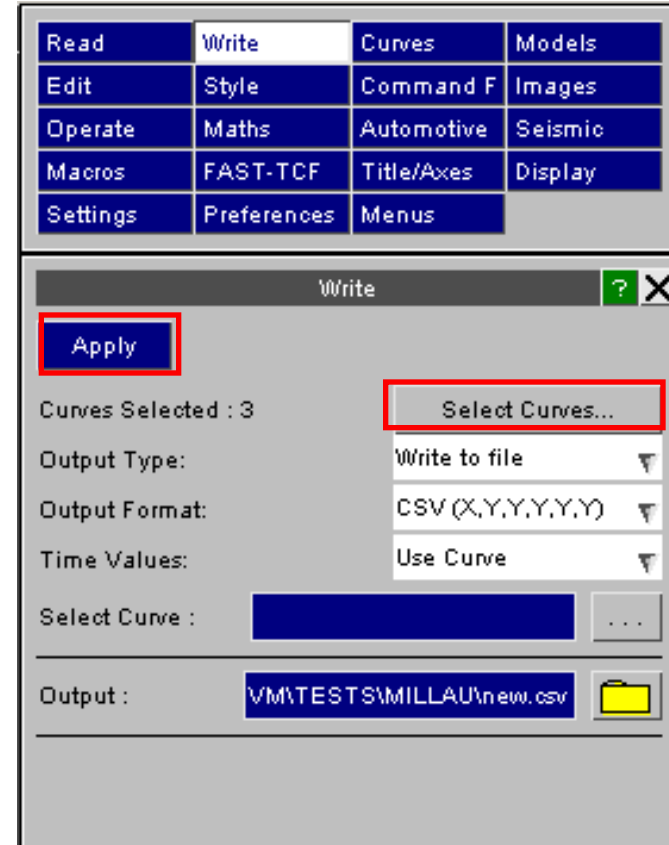
LS-DYNA ENVIRONMENT

ARUP

# Output Options - Curves



- In the Write menu, select type of file e.g. CSV.
- Give the filename.
- Select Curves to be written.
- Press Apply.

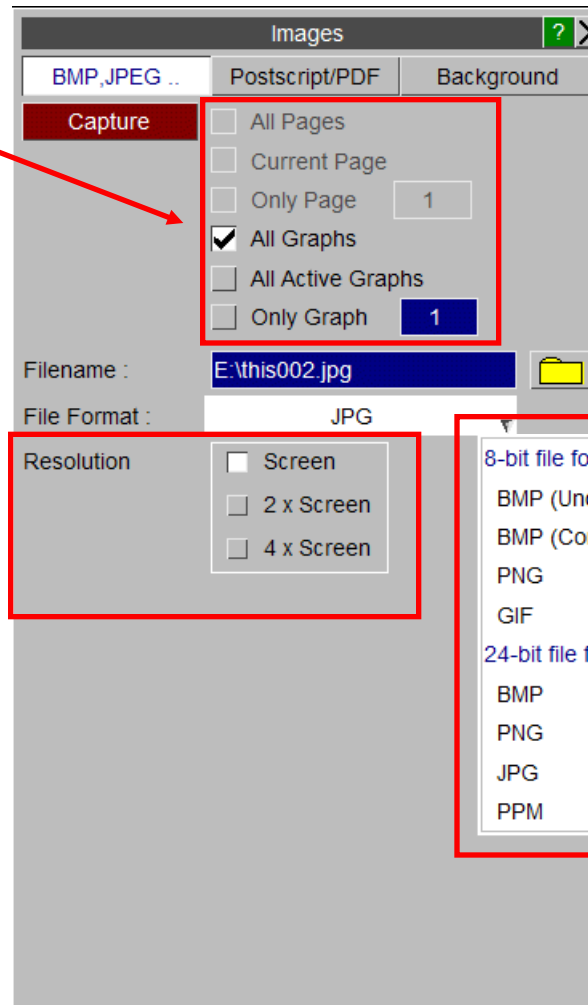


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# Output Options - Images

Images can contain multiple graphs.

Image output formats include PNG and GIF.



Images can be generated using either the screen resolution or at 2, 4 times the screen resolution for printed output.

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# Output Options - Postscript / PDF

Images can contain multiple graphs.

The screenshot shows the 'Images' dialog box with the 'Postscript/PDF' tab selected. A red box highlights the 'All Graphs' checkbox, which is checked. Another red box highlights the 'Postscript' checkbox under 'File Format', which is also checked. The 'Filename' field shows 'E:\this001.ps'. The 'Plot' button is visible on the left. The 'Resolution' section has 'Screen' selected. The 'Orientation' section has 'Portrait' selected. The 'Aspect Ratio' section has 'Fixed' selected. The 'Paper Size' section has 'A4' selected. The 'Layout' section has '1x1' selected. A green preview window on the right shows a single graph labeled '1'.

T/HIS can write both Postscript and PDF files.

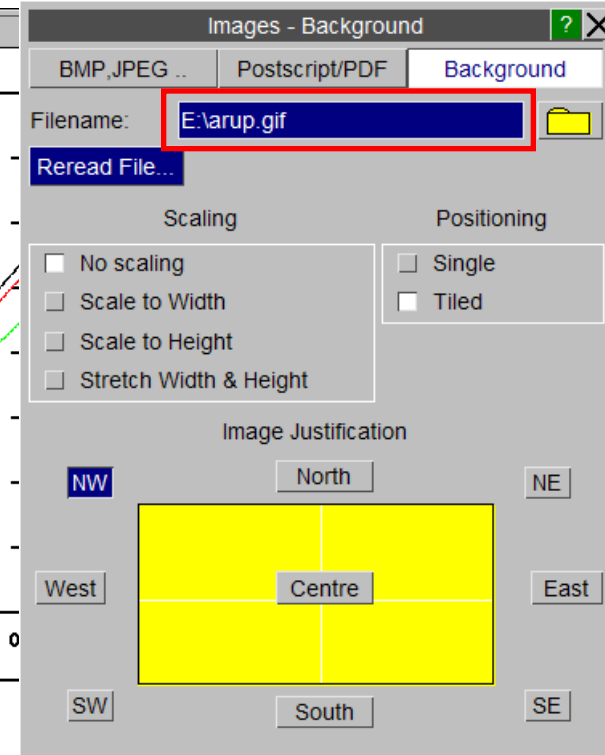
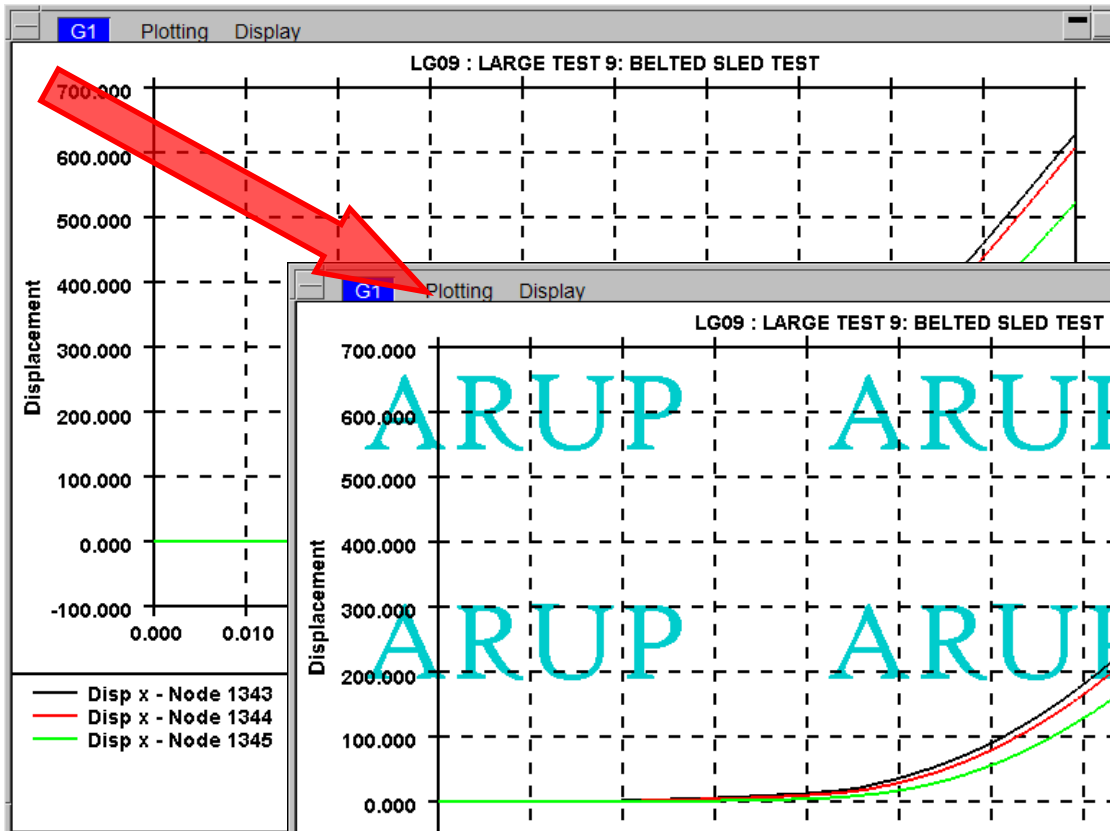
PDF and Postscript files are generated using raster images to reproduce the screen contents exactly.

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# Images – Background

Images can be used for the graph backgrounds.

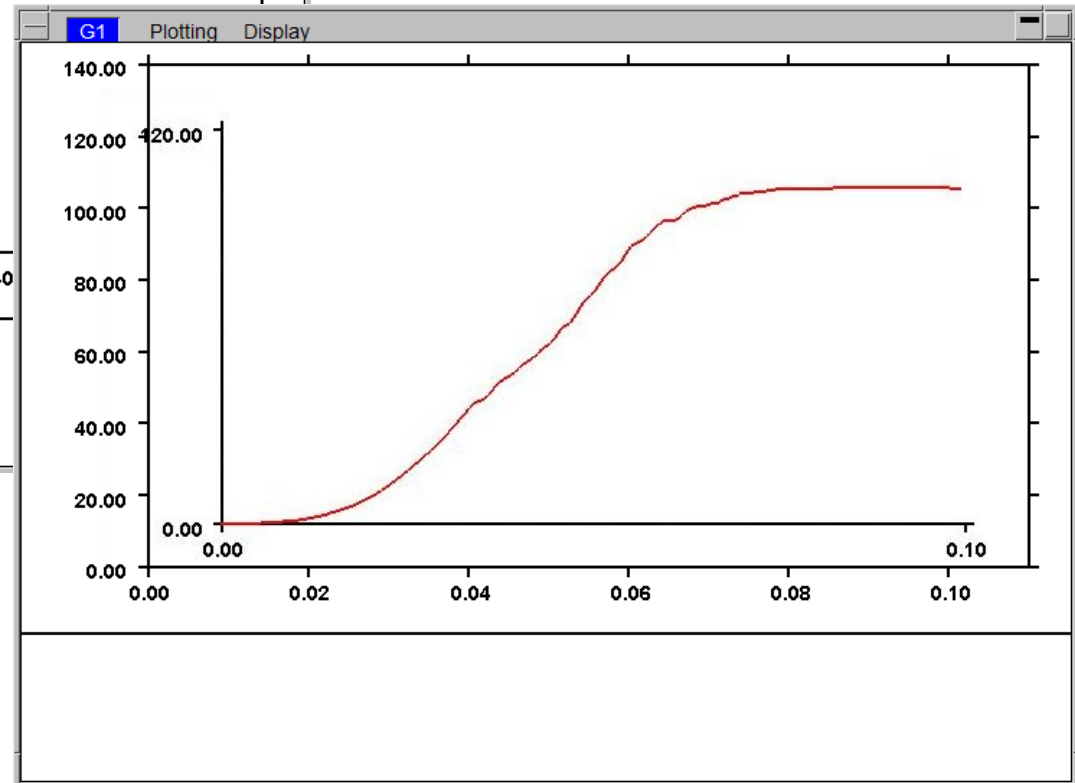
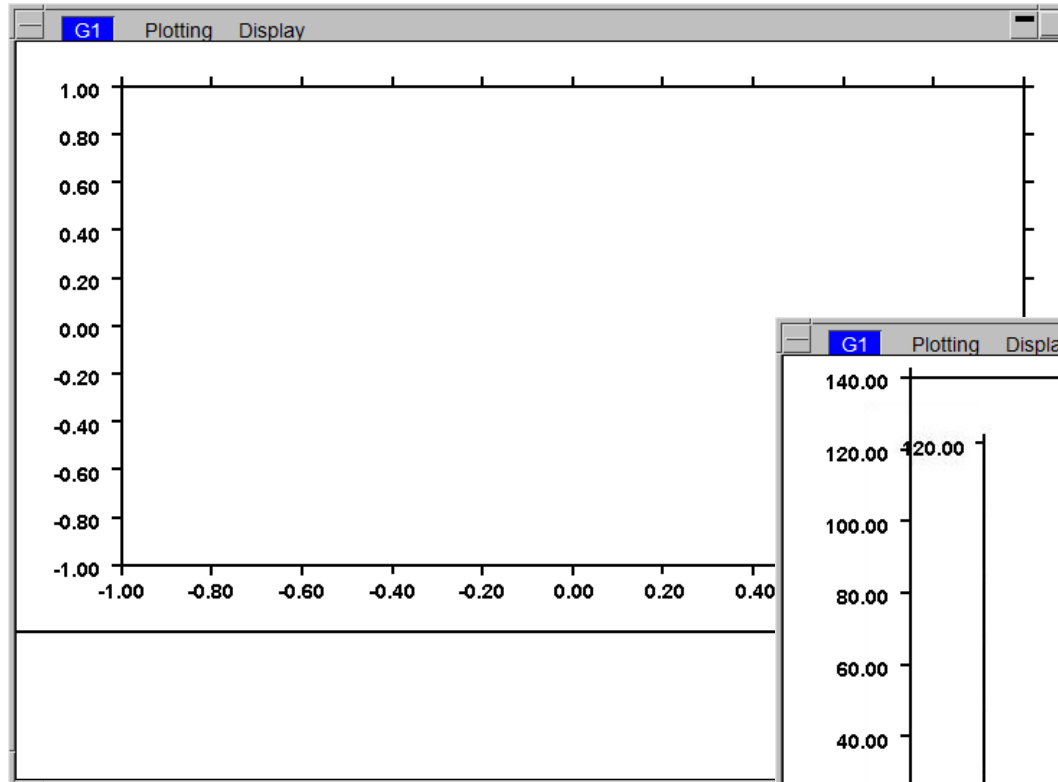


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# Digitising – using a background image

Oasys

T/HIS



1) Read in a background image.

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Oasys

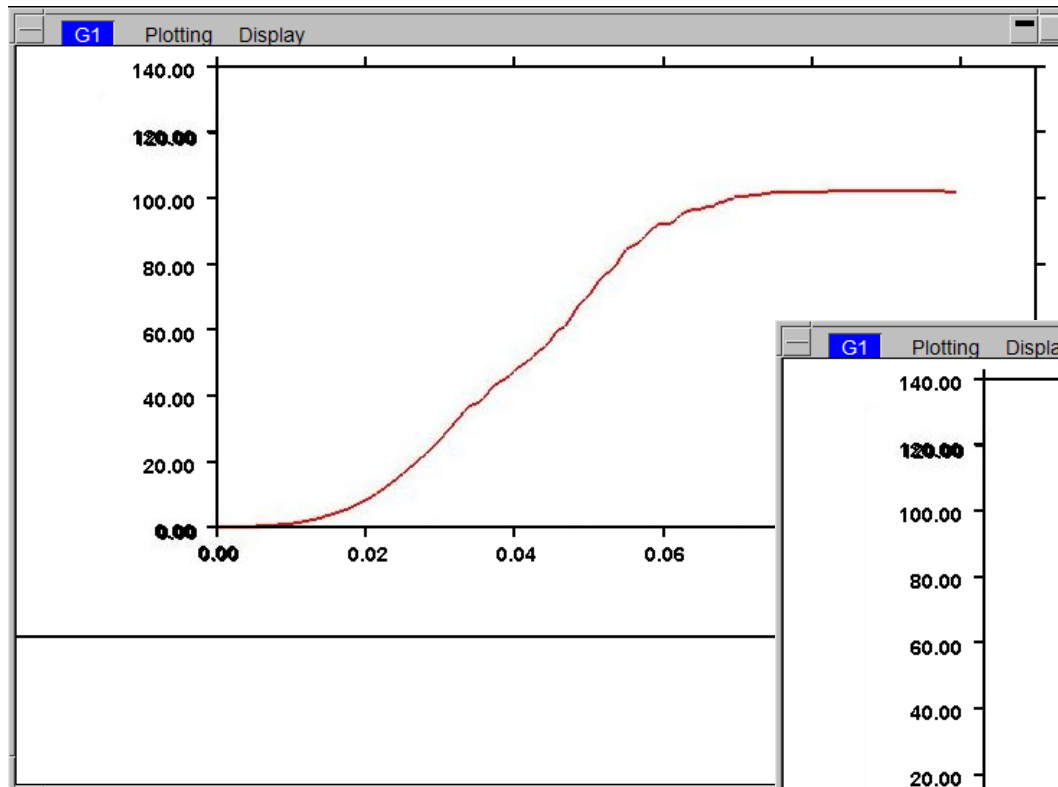
LS-DYNA ENVIRONMENT

ARUP

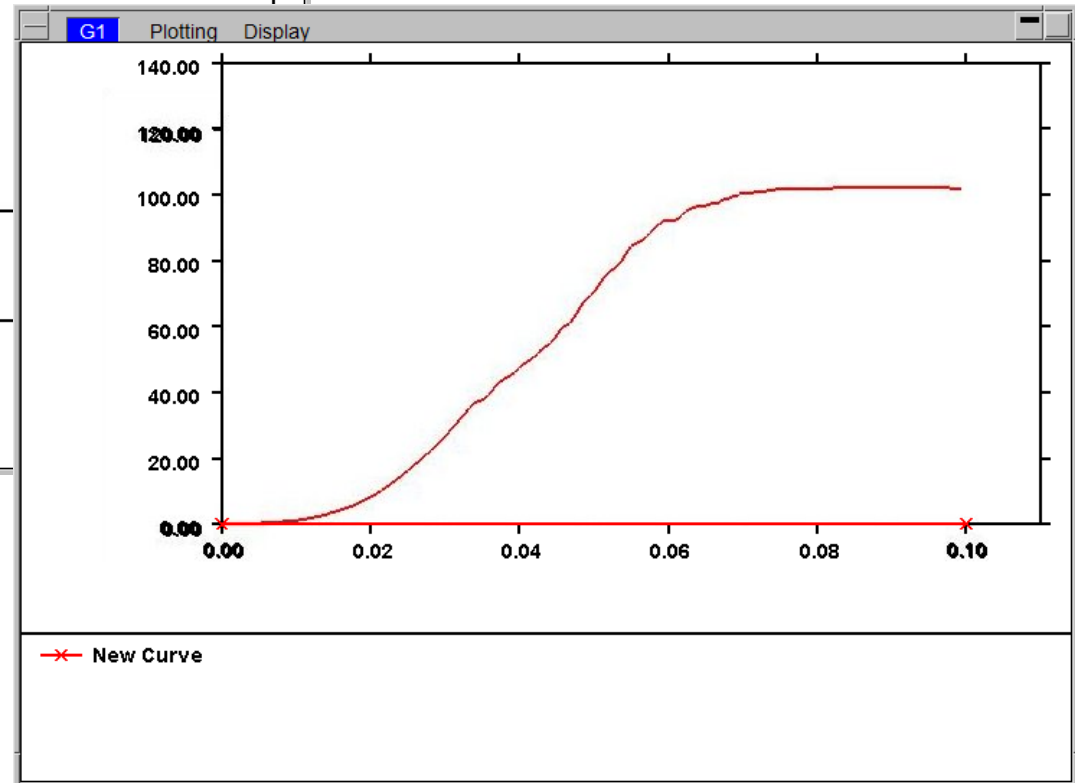
# Digitising – using a background image

Oasys

T/HIS



2) Set Axis limits and drag graph borders to match background image.



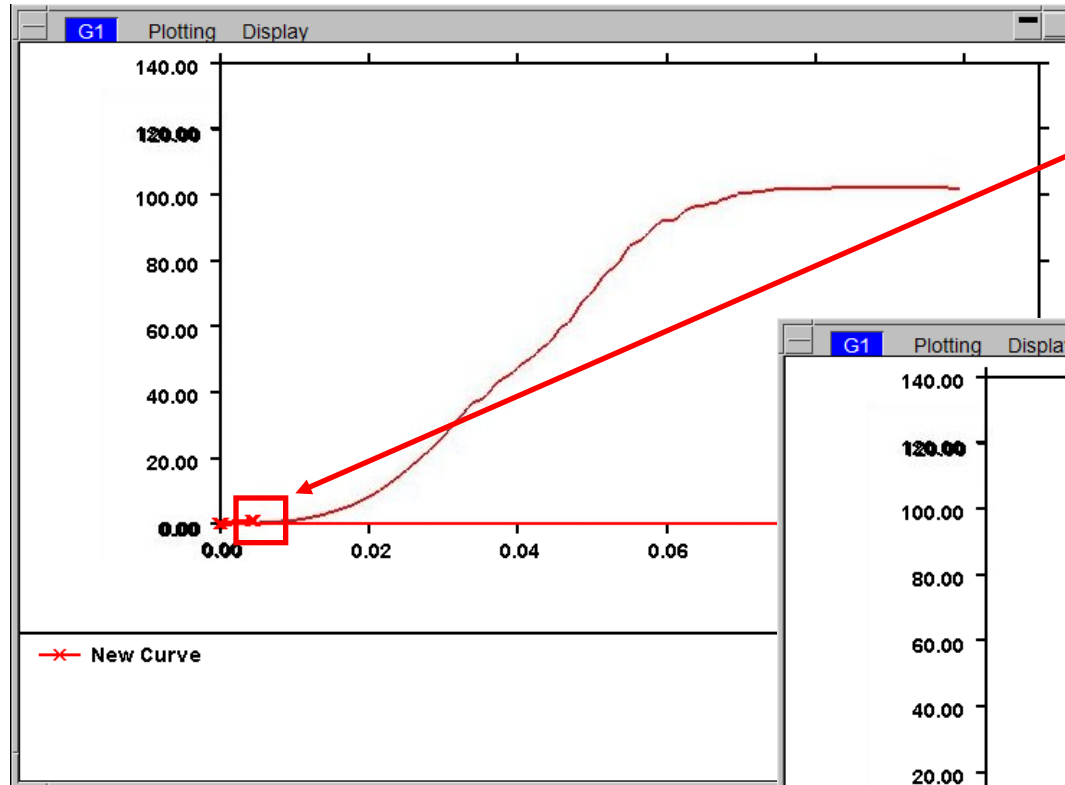
3) Create a new curve

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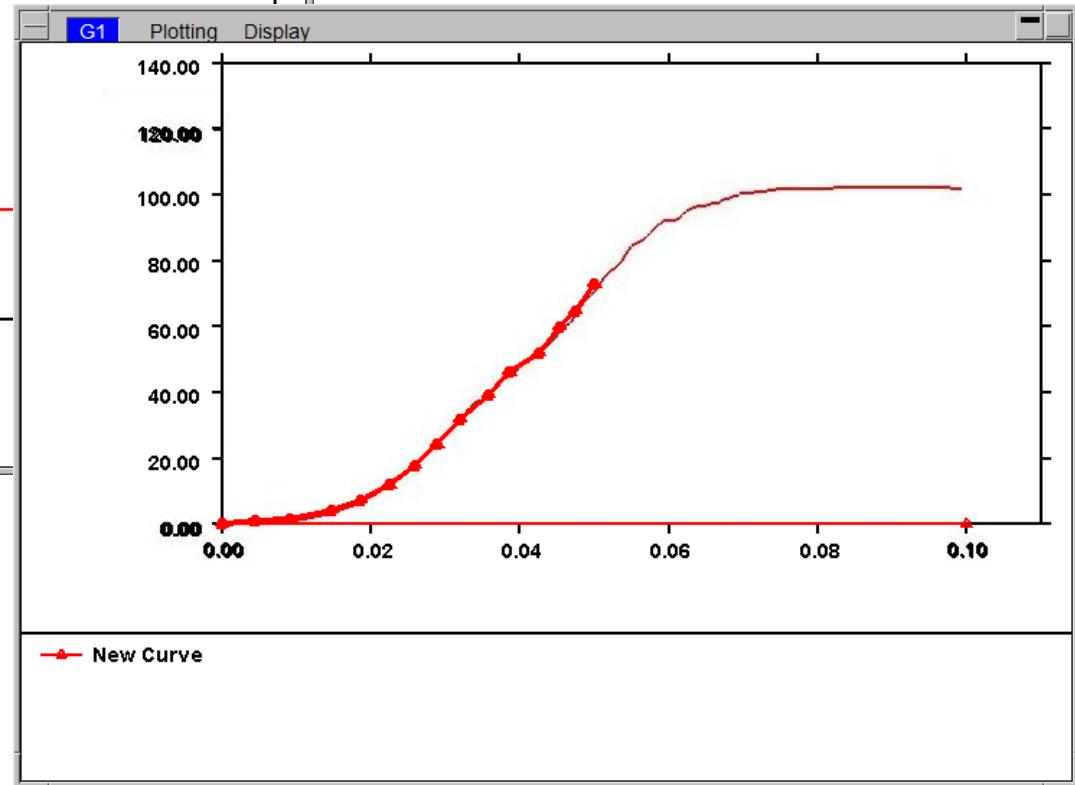
# Digitising – using a background image

Oasys

T/HIS



4) From the EDIT menu, select *Modify->Drag XY* and drag the second point onto the curve.



5) Select *Insert->At End* and click to create more points

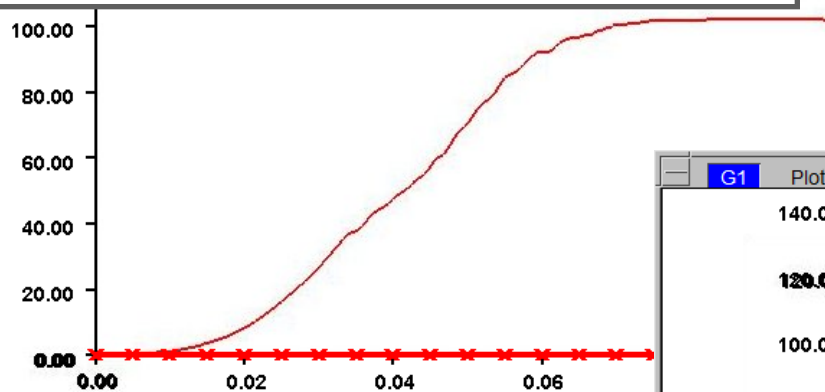
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# Digitising – using a background image

Oasys

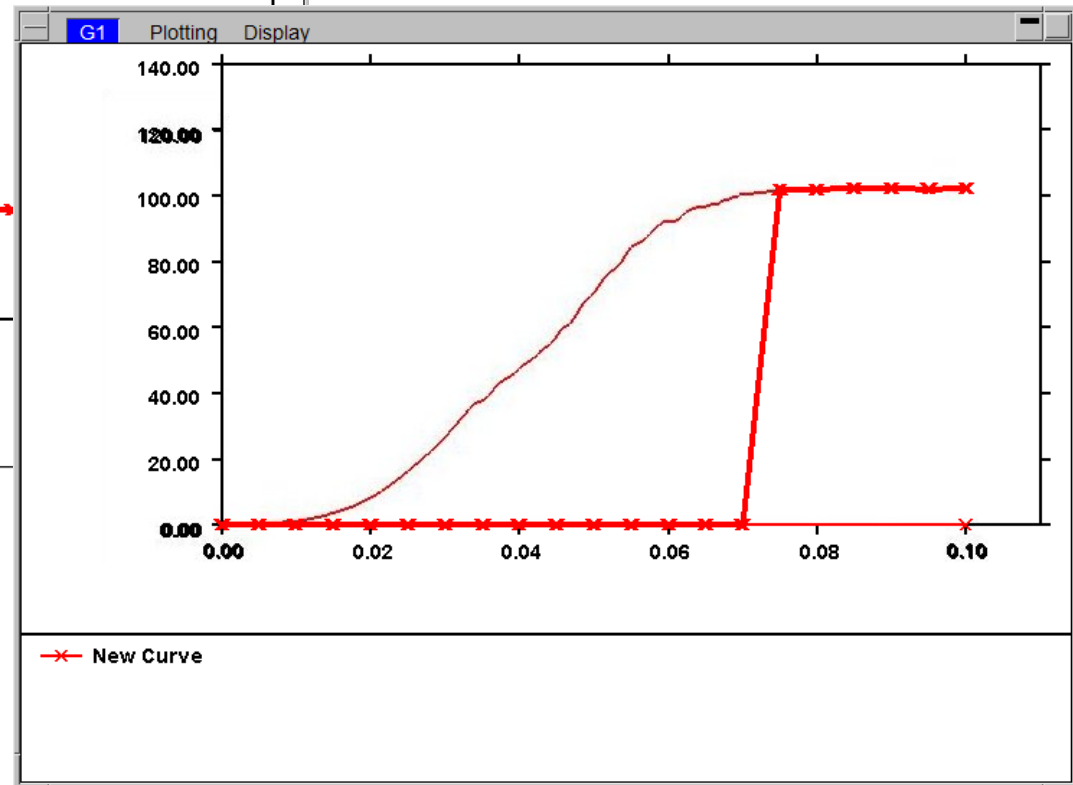
T/HIS

An alternative method for creating a curve with evenly spaced points along the x-axis is to replace steps (4) and (5) with



—x— New Curve

4) From the EDIT menu, select *Insert->Split Segment* and split the curve into 20 segments.



5) Select *Modify->Drag Y* and drag points to match curve

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Oasys

LS-DYNA ENVIRONMENT

ARUP

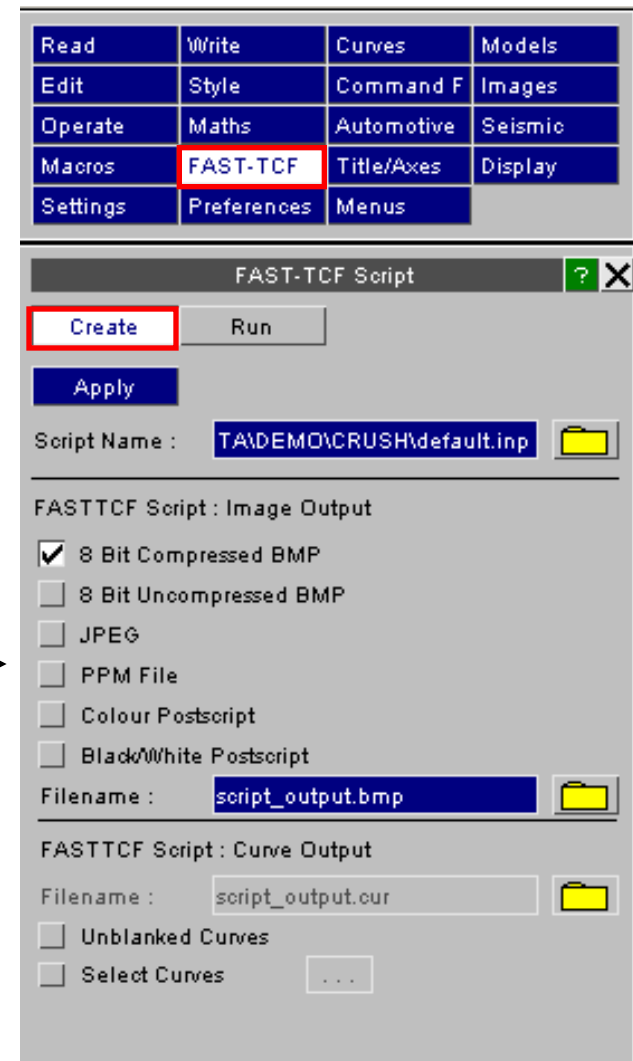


- FAST-TCF is a scripting language for T/HIS, for use with automatic post-processing.
- Scripts are easy to write and edit by hand, and can also be recorded by T/HIS.
- A FAST-TCF script can contain all of the commands to setup and position multiple graphs, read in data, perform curve operations and generate output.

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- Automatic generation of FAST-TCF scripts
  - Records operations that created the currently visible curves
  - More robust than command files, not dependent on history
  - Easily editable

**Select file type to  
be generated by  
FAST-TCF script**



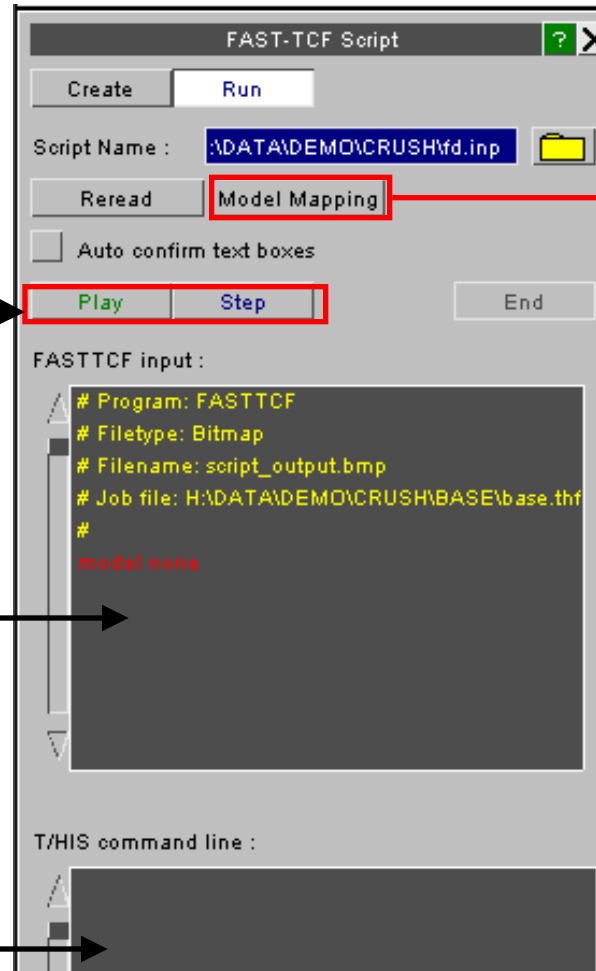
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# FAST-TCF - Play-back of scripts

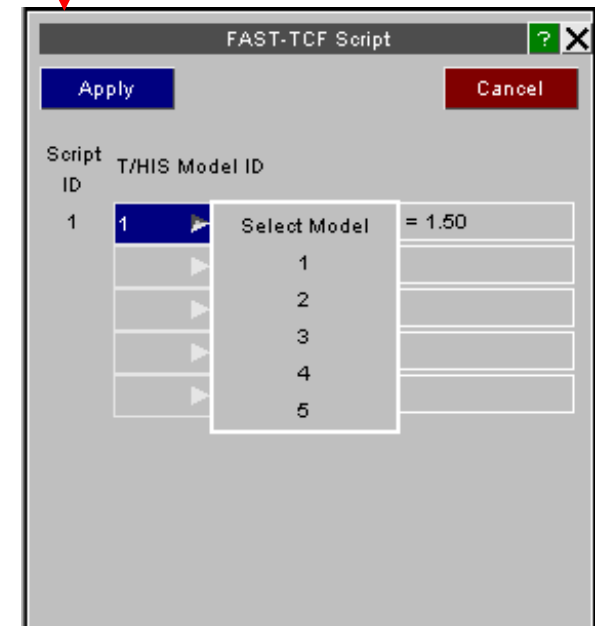
Can be played or stepped through line by line \

FAST-TCF Script

Feedback in interpreter window



- Model Mapping – used with multiple models to define which model in T/HIS corresponds to which model in the script.



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- FAST-TCF supports almost 100% of T/HIS commands.
- Multiple data selection by range including tags 'first', 'last' and 'all'
  - Vastly improved speed up through reading all data in single file pass

eg. *sect 100:last force z\_dir*

- Read data from multiple models

eg. *Model 1* or *Model all*

- Improved functionality requires some changes to existing scripts.
  - Changed syntax for using variables in filenames

*\$filename.cur* replaces *\$filename .cur*

- FAST-TCF defaults for plot setups are now standard T/HIS ones
- Must specify data component for rigidwall and strain data

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- Multiple read/operation syntax examples:

- Multiple operations using many curves with the same tag:

***Sect 100:last force z\_dir tag sec\_fz***

The z-force on cross sections 100 to (last) will be extracted. All curves will be given the same tag, "sec\_fz".

***Oper mul sec\_fz 0.001 tag sec\_fzkN***

All curves with the tag "sec\_fz" will be multiplied by 0.001; the resulting curves will all be given the same tag, "sec\_fzkN".

- Alternative version having the same effect – wild-card (\*) used to generate and identify tags:

***Sect 100:last force z\_dir tag sec\_fz\****

The z-force on cross sections 100 to (last) will be extracted. Curves will be given tags "sec\_fz1", "sec\_fz2", etc.

***Oper mul sec\_fz\* 0.001 tag sec\_fzkN\****

All curves with the tag "sec\_fz\*" (where \* can be any alphanumeric characters) will be multiplied by 0.001; the resulting curves will be given tags "sec\_fzkN1", "sec\_fzkN2", etc.



- Multiple read/operation syntax examples:

- Using the entity ID in automatically-generated tags (## command):

***Sect 100:last force z\_dir tag sec\_fz##***

Curves will be given tags “sec\_fz100”, “sec\_fz101”, etc, according to the ID of the entity whose data is shown in the curve.

***Oper mul sec\_fz\* 0.001 tag sec\_fzkN##***

During the operation, the entity ID from the original curve (e.g. sec\_fz100) will be used to form the tag of the output curve (e.g. sec\_fzkN100)

- Other examples of reading multiple entities:

***Node all accel z tag acc\_z***

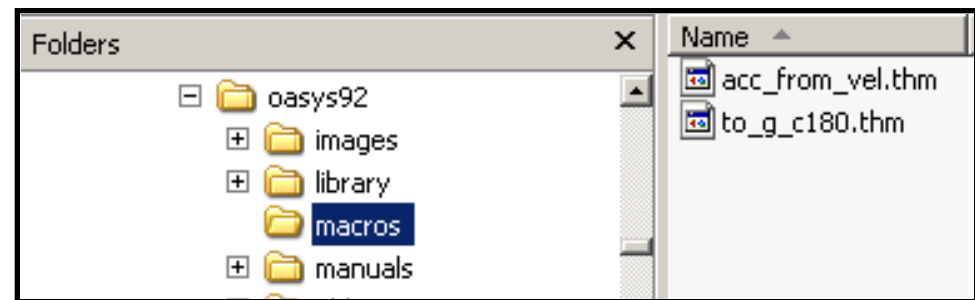
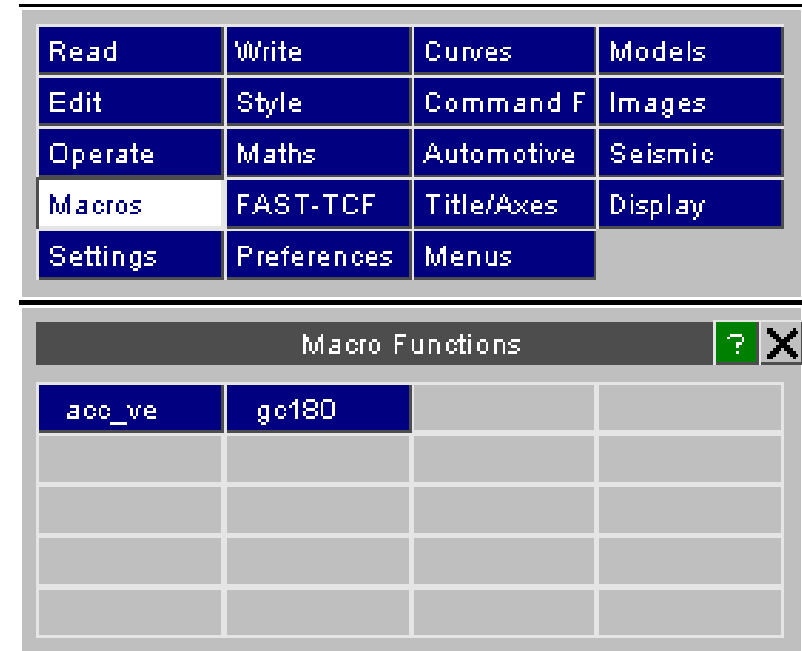
All nodes

***Node 89,90,100000 accel z tag acc z***

Nodes 89, 90 and 100000

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- Macros may be defined by the user for quick access to common sequences of operations.
- Each macro is a FAST-TCF script with some additional lines specific to macros, and extension .thm.
- Macros may be kept in a subdirectory *macros* from the directory containing the T/HIS executable, or else in a subdirectory *macros* from the user's home directory.
- T/HIS creates a button for each macro.



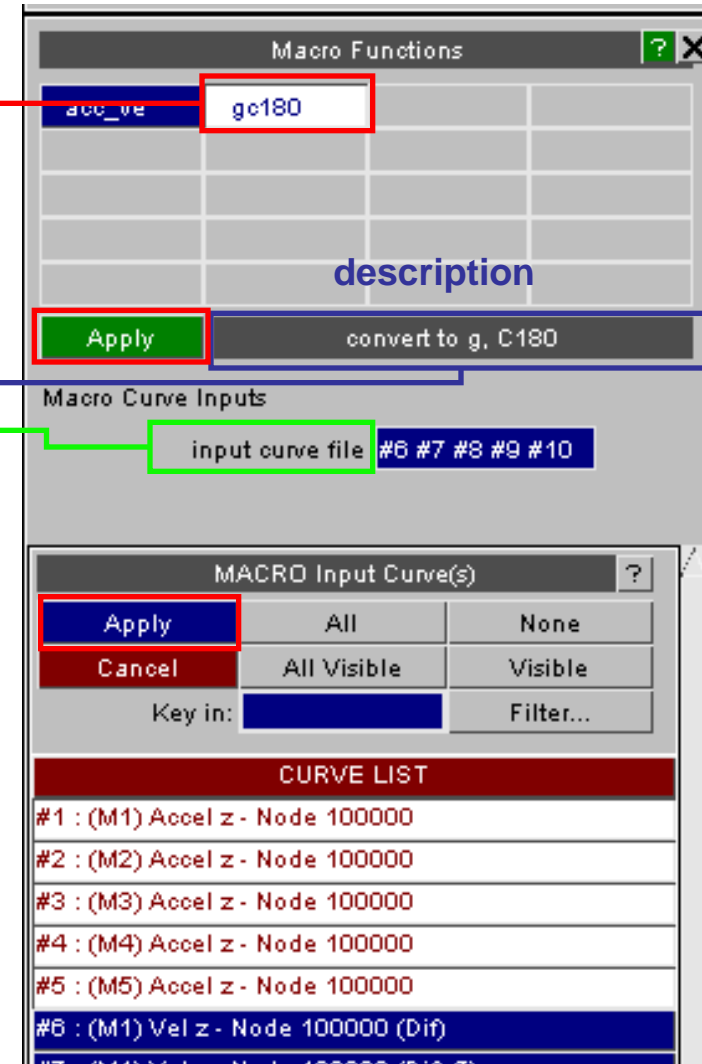
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- Example 1 – macro with one curve as input

```
#
# Apply C180 filter, then mm/s^2 to g
#
macro acr gc180
macro title convert to g, C180
macro curve input_curve input curve file
#
operation c180 $input_curve tag curve_2
operation div curve_2 9810 tag curve_3
```

- Inputs to the macro can be curves or constants.
- Input names are variables, so use \$ when referring within main part of script, e.g. \$input\_curve

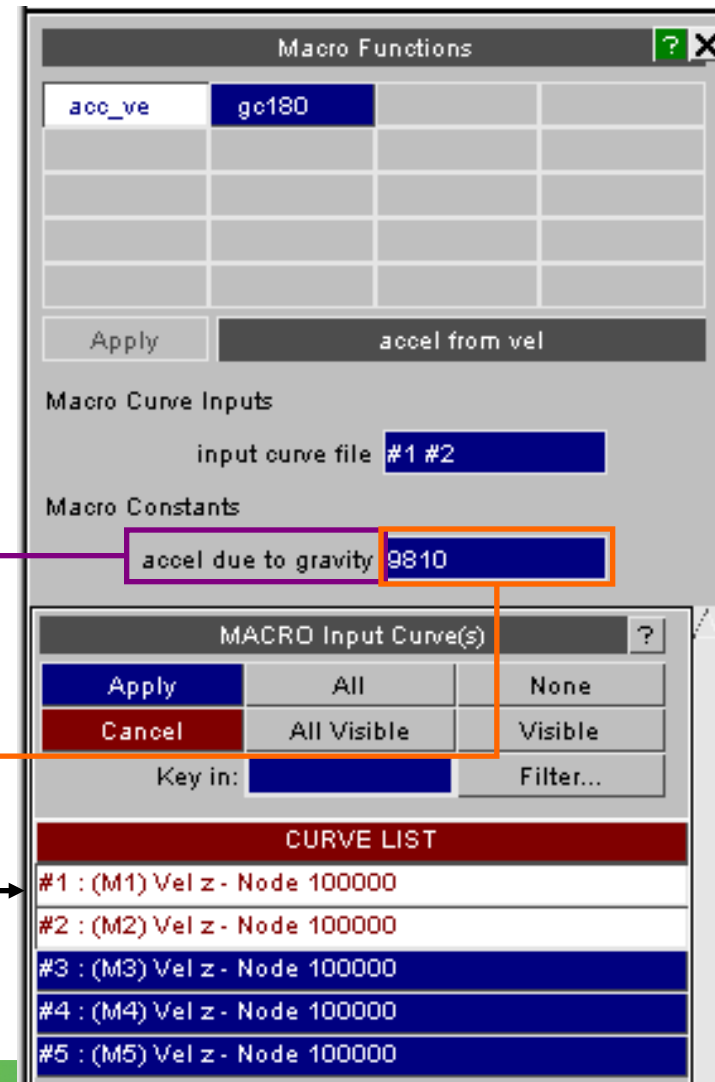
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- Example 2 – macro with one curve and one constant as input

```
#
# Converts velocity into accel, with
# user-defined g-value
#
macro acr acc_ve
macro title accel from vel
macro curve input_curve input_curve file
macro constant gvalue accel due to gravity
#
operation dif $input_curve tag curve_2
operation div curve_2 $gvalue tag curve_3 #
```

**Pick curves for  
the macro to  
operate on**



<b><i>filename</i></b>	LS-DYNA output file (d3thdt, .thf etc) that T/HIS opens and reads when it starts
<b><i>-model_list=filename</i></b>	<i>filename</i> is a file containing a list of LS-DYNA results files for T/HIS to open.
<b><i>-curve_list=filename</i></b>	<i>filename</i> contains a list of T/HIS curve files, one per line, which are opened and read when T/HIS starts.
<b><i>-curve=filename</i> <i>-cur=filename</i></b>	<i>filename</i> is a T/HIS curve file which is opened and read when T/HIS starts
<b><i>-bdf=filename</i></b>	<i>filename</i> is a T/HIS Bulk Data File which is opened and read when T/HIS starts.
<b><i>-startin=directory</i></b>	Specify a directory for T/HIS to start in.
<b><i>-tcf=filename</i></b>	<i>filename</i> is a T/HIS FAST-TCF script
<b><i>-cf=filename</i></b>	<i>filename</i> is a T/HIS command file

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# ARUP

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